SCOMM

#17:9

		RUN		HARVEST		ESCAPEMENT	
Bristol Bay PINK	70	2.5	———	1.6		.9	
	1	———	———	———		———	
	2	1.4	130,000	800,000		600,000	
	3	———	———	———		———	
	4	300,000	980,000	———		600-900,000	
	5	———	———	———	———	———	———
	6	3.05	1.6	2.0-2.4	740,000	600-1.0	860,000
	7	———	———	———	———	———	———
	8	3.2	13.8	2.2-2.6	5.2	600-1.0	8.6
	9	———	———	———	———	———	———
Bristol Bay SOCKEYE	70	56.0	39.64	34.6		21.4	
	1	16.9	15.5	9.5		6.4	
	2	10.3	5.4	5.1		5.2	
	3	6.2	2.43	1.5		4.7	
	4	5.3	11.3	———		9.5	
	5	12.9	24.15	———	4.83	17.5	19,337
	6	12.0	12.18	6.25	6.27	5.75	5.91
	7	8.4	9.52	3.2	4.71	5.2	4.81
	8	11.5	19.7	6.0	9.7	5.5	10.0
	9	22.7		13.2		9.5	

		RUN		HARVEST		ESCAPEMENT	
Chignik PINK	70	1.7	——	——		——	
	1	——	——	——		——	
	2	——	113,000	——		——	
	3	——	184,000	——		——	
	4	200,000	300,000	——		200,000	
	5	180-750,000	——	——		600,000	[illegible]
	6	200-820,000	910,000	120,000	400,000	500-700,000	510,000
	7	750,000	1,340,000	70,000	590,000	680,000	750,000
	8	2.7	1,930,000	2.3	980,000	400,000	950,000
	9	2.6		800,000		1.8	
Chignik SOCKEYE	76	1.2	2.51	550,000		650,000	
	1	1.7	2.3	1,086,000		650,000	
	2	857,000	910,000	207,000		650,000	
	3	780,000	1.64	100,000		650,000	
	4	910,000	1.3	340,000		650,000	
	5	1,090,000	933,000	440,000	399,000	650,000	534,000
	6	715,000	1.95	65,000	1.13	650,000	820,000
	7	2,009,000	2.69	1,350,000	1.96	650,000	730,000
	8	1.7	2.20	1,050,000	1.6	650,000	680,000
	9	2.1		1,450,000		650,000	
South Peninsula PINK	70	——		——		——	
	1	——		——		——	
	2	——		——		——	
	3	——		——		——	
	4	——		——		——	
	5	100-700,000		——		——	525,000
	6	1.15	3.67	100,000	2.4	800-1.4	1.-7
	7	1.10	3.02	——	1.36	1.3	1.66
	8	4.3	8.7	3.0	5.8	1.3	2.9
	9	9.5		8.2		1.3	

		RUN		HARVEST		ESCAPEMENT	
Prince	70	347,000	324.000	197,000		150,000	
William S.	1	760,000	760,000	560,000		200,000	
CHUM	2	800,000	360,000	600,000		200,000	
	3	643,000	1,280,000	443,000		200,000	
	4	294,000	280000	94,000		200,000	
	5	215,000	161,000	15,000	101,000	200,000	60,000
	6	1,800,000	460,000	1,600,000	380,000	200,000	80,000
	7	750,000	715,000	450,000	570,000	300,000	145,000
	8	640,000	650,000	390,000	490,000	250,00	160,000
	9	360,000		110,000		250,000	
Southern ♦	70	2,000,000	650,000	1,800,000		200,000	
Outer Cook	1	480,000	770,000	280,000		200,000	
Inlet	2	750,000	55,000	500,000		250,000	
PINK	3	———	———	———	———	———	
	4	340.000	100,000	40,000	———	300,000	
	5	620,000	1,232,000	320,000	1,032,000	300,000	200,000
	6	780,000	200,000	480,000	140,000	300,000	60,000
	7	850,000	1,700,000	550,000	1,340,000	300,000	360,000
	8	635,000	480,000	335,000	350,000	500,000	130,000
	9	1,700,000		1,400,000		300,000	
Kodiak	70	20.2	14.8	16.6		3.6	
PINK	1	8.3	54	7.0		1.3	
	2	9.5	3.55	6.5		3.0	
	3	7.8	980,000	6.5		1.3	
	4	2.9	4.64	———		3.0	
	5	3.0	3.83	1.7	2.945	1.3	885,000
	6	12.9	13.65	9.9	10.66	3.0	2.99
	7	8.6	8.15	7.4	6.27	1.2	2.24
	8	14.1	19.0	11.4	15.0	2.7	4.0
	9	13.2		11.2		2.0	

		RUN		HARVEST		ESCAPEMENT	
Southern	70	18.7	9.9	13.2		5.5	
Southeastern	1	4.3	11.0	—		5.0	
PINK	2	14.5	13.9	8.5		6.0	
	3	14.0	7.9	8.0		6.0	
	4	6.8	6.74	0.8		6.0	
	5	2.0	7.58	—	3.1	6.0	4.48
	6	4.1	9.55	—	4.8	6.0	4.75
	7	12.0	167	6.0	11.2	6.0	5.5
	8	22.1	22.6	16.1	17.5	6.0	5.1
	9	15.4		9.4		6.0	
Northern	70	9.0	6.44	6.5		3.5	
Southeastern	1	8.5	555	4.5		4.0	
PINK	2	12.0	6.0	8.0		4.0	
	3	6.0	3.8	2.0		4.0	
	4	9.3	2.0	5.3		4.0	
	5	4.6	2.083	0.6	583,000	4.0	1.5
	6	1.5	910,000	—	170,000	4.0	740,000
	7	2.9	6.1	—	2.3	4.0	3.8
	8	5.0	4.9	1.0	2.5	4.0	2.4
	9	9.2		5.2		4.0	
Prince	70	4.4	3.704	3.1		1.3	
William S.	1	6.2	9.5	4.7		1.5	
PINK	2	1.7	690,000	0.2		1.5	
	3	2.7	3.31	1.2		1.5	
	4	2.0	1.33	0.5		1.5	
	5	3.1	5.953	1.6	4 A53	1.5	1.5
	6	6.7	3.86	5.2	2.79	1.5	886,000
	7	6.3	6.2	4.8	4.5	1.5	1.7
	8	4.4	3.9	2.9	2.8	1.5	1.1
	9	8.4		6.9		1.5	

	South. SE	North. SE	Prince PINK	Prince CHUM	S&O COOK INLET	Kodiak	Chig. PINK
70	88%	39%	18.7%	7.09%	207%	36.4%	—o—
1	-60%	53%	-34.7%	0%	-37.6%	53.7%	—o—
2	4.3%	100%	146%	12[illegible]%	1263%	168%	—o—
3	77%	57%	-18.4%	-49.7%	—o—	496%	—o—
4	.89%	365%	50.3%	5.0%	240%	-38%	-33%
5	-74%	346%	-47.9%	33.5%	-49.6%	-22%	—o—
6	-57%	64%	73.5%	29.1%	290%	-5%	-9.8%
7	-28%	-52%	1.64%	4.89%	-50%	6%	-44%
8	-2.2%	2%	12.8%	-1.53%	32.2%	-26%	39%

	Chig. SOCKEYE	S. Peninsula	Brist. PINK	Brist. SOCKEYE
70	-52.1%	—o—	—o—	41.3%
1	-26.1%	—o—	—o—	9.0%
2	-58%	—o—	976.9%	90.7%
3	-52.4%	—o—	—o—	155.1%
4	-23.8%	—o—	-69.4%	-53.1%
5	16.8%	—o—	—o—	-46.6%
6	-63.3%	-68.7	90.6%	-6.3%
7	-25.7%	-63.6	—o—	-11.8%
8	-25.4%	-50.6	-76.8%	-41.6

Fisheries Management in Alaska - A Comparison

For: The Limited Entry Study Group

By: Pat Mc Corkle, A.A.,
Revised by: Donna Mayer, A.A.

Date: December 6th, 1979

Phase I - Graphs

Phase II - Outline

Management

A. Escapement - set optimum goals
   1. Survey of major escapement systems to measure the actual amount of good spawning area
   2. Historical escapement trends

   These are the criteria used to determine the optimum escapement goals for a system.

B. Subsistence
   1. Quotas
   2. Problems - where subsistence management falls down

C. Run Size
   1. Forecasts
      a. Pre-emergent fry indices
         i. linear regression
         ii. multiple regression
         iii. weighted
            a. intertiday vs. upstream
            b. average escapement
      b. Average annual air temperature (S.E.)
      c. Indices
         i. fry fitness
         ii. brood year fry
      d. Average percentage contribution of 4-year old fish
         i. calculations for other ages
      e. Average return per spawner X brood year escapement
      f. Adult returns vs. pre-emergent fry index
      g. Parent year escapement
      h. Problems - where forecasts can go wrong
   2. Catch data
      a. Information from fish tickets - actual amount of fish caught and sold
      b. Subsistence catches
   3. Counting (escapement)
      a. Fish weirs
      b. Counting towers
      c. Aerial surveillance
      d. Sonar enumeration systems
      e. Test fishing
      f. Problems

D. Actual In-season Harvest Management
   1. Quotas
      a. Set by Fish and Game
      b. Set by cannery/processor
   2. Set openings & closings
      a. Emergency orders
   3. Communication
      a. with fishermen
      b. with canneries/processors
      c. Calculations on an average
   4. Gear size regulations
      a. net mesh size
      b. net length
      c. net depth
   5. Problems
      a. Overescapement
      b. Underescapement
      c. Too much gear in the water
      d. Management is being done from the office

FISHERIES MANAGEMENT IN ALASKA ... A COMPARISON

PHASE I

I have graphed, on the same graph, the forecasted run totals and the actual run size for the years 1970 through 1978 and predictions through 1979 for each of the following fisheries and administrative areas: Southern Southeastern Pink, Northern Southeastern Pink, Prince William Sound Pink, Prince William Sound Chum, Southern Outer Cook Inlet Pink, Kodiak Pink, Chignik Pink, Chignik Sockeye, Southern Penninsula Pink, Bristol Bay Pink, and Bristol Bay Sockeye. I have found it most difficult to apply and generalizations to these fisheries, in some areas the number of returning fish has increased since 1970 and in some areas it hasn't. Another very broad generalization on the accuracy of Fish & Game predictions allows me to say that the Fish & Game tends to predict on the lower side of the actual run size. From this data, I conclude that it will take another three or four years of strict Limited Entry enforcement to show any definite impacts due to Limited Entry alone, because also in the time since Limited Entry was adopted, the Japanese mothership fisheries in Bristol Bay were curtailed and the 200 mile limit was installed and enforced. This has had a large impact on the fishery, especially in Bristol Bay. It will take some time for those effects to stabilize.

PHASE II

A. Escapement

One of the first steps in the management of Alaska's commercial fisheries is to identify major spawning systems and set optimum escapement goals for them. Optimum escapement goals are set by looking at the past escapement trends of the system and by actual survey of the area. Where possible, field biologists have gone in and measured the actual amount of good spawning area in the system for use in their calculations. Items taken into consideration are: gravel size, stream depth, current strength and what type of predators are in the area. The Department of Fish and Game bases a large part of tis management strategies upon these calculations and the numbers resulting from them.

B. Subsistence

Another important consideration in the management of Alaska's commercial fisheries is the subsistence fishery. In some areas, mainly the Arctic-Yukon-Kuskokwim area, subsistence fishing has been given the highest use priority and commercial fishing is considered only after the subsistence and escapement goals are met. The Alaska subsistence fishery is managed basically through the use of quotas per each permit and through mandatory annual renewal of those permits. Lately the subsistence fishery has been declining due to the absence of younger fishermen, increased welfare programs and employment opportunities and in places where the snowmobile is replacing dog sleds for transportation.

Currently, there is a definite problem in the subsistence fishery dealing with subsistence roe sales.
In some areas, the Department of Fish and Game has allowed the subsistence fishermen to sell subsistence-caught salmon roe. This has resulted in several cases of waste and abuse of the subsistence resource such as stripping fish and leaving them.

Another problem within the subsistence fishery is that enforcement of subsistence fishing laws is difficult due to the fact that subsistence fishermen usually live in isolated villages and it is difficult for them to get in to renew their permits and report their catches and also it is difficult for the Department of Fish and Game to be available to all subsistence fishermen at all times.

C. Run Size

For good management of Alaska's commercial fisheries, the Department of Fish and Game needs to have some idea as to how the runs are shaping up and what amounts of fish can reasonably be expected in the respective administrative areas. Predictions or forecasts attempt to give an elementary base for calculations and planning. There are several different methods of forecasting the run size, the methods differ from administrative area to administrative

area as well as within the area itself.

1. Forecasts

Forecasts based on pre-emergent fry indices can be straight, year-by-year linear regressions for a fishery that is more or less proven to be stable or multiple regression, where only certain previous pre-emergent fry or parent year escapement counts are considered. The multiple regression method is used when the fishery follows a peak year cycle or a distinct even year - odd year difference in run size. The index can also be weighted to show intertidal vs. upstream spawning and survival rates and the previous average escapement for that system.

A forecast consideration peculiar to the Southeastern administrative area is the use of average annual air and/or water temperatures, taken at 15 stations throughout the Southeast area over a number of years. Some years only the air temperature is used and others only the water temperature or a combination of the two is used.

Several other indices aside from the pre-emergent fry are used in forecasting, including a fry fitness sample index, brood year fry counts or counting fry spawned in a specific year, and parent year escapements. Also, combinations of these are used in some areas such as adult return counts vs. the pre-emergent fry index.

A forecast method peculiar to the Prince William Sound chum forecast is based on the average percentage contribution of 4-year-old fish, and then expanding upon that number to include the contributions of other brood years.

There are alot of problems with fishery predictions. One of the biggest of these is weather. If, for instance, one area has an extreme condition such as an earthquake, a heat wave, flood, drought or early freeze, any one of these can adversely affect the developing salmon. The effect of these types of extreme conditions may not be seen until several years later when the runs suddenly drop off. Also, extreme weather conditions affect the normal habits of the predators, causing them to take more than the usual amount of spawning salmon for their food and disturbing pre-deposited eggs.

2) Catch Data

Along with counting the estimating escapement, catch data plays an important part in the management of the fisheries. This data is the most accurate record of the actual catch size available. It comes directly from the fish tickets themselves which are required from all of the canneries

and processors for each catch the fishermen purchase. This data combined with the escapement index or data provides the basis for run size figures.

3) Counting

Along with the forecasts, counting or estimating the escaping fish is a major consideration. There are several ways to accomplish this. One of them is through the use of a combination of fish weirs and counting towers, man-made obstacles places in the path of the spawning salmon causing them to expose themselves in countable numbers to the observers in nearby towers.

Aerial surveillance is another method of estimating the size of the run. Low-flying planes make slow sweeps over known major spawning systems while biologists make estimates as to how many fish are contained in the area. One problem with this method and also with counting towers is that often the river or stream is too murky due to silt, run-off or other natural causes to accurately count the spawning salmon.

A method of counting escapement that is beginning to see more use, especially in the Bristol Bay administrative area, is that of sonar enumeration. In this method, sonar counters are placed at the mouth of major streams and spawning systems to count all of the fish that pass it. There are still some problems to be conquered with this method, such as how to keep the machine from being clogged with the natural debris that comes down the river. Another difficulty preventing this method from being widely used is that use would only be justified in major spawning systems. In Southeast, for instance, where there are many small streams where spawning salmon can be found, the high cost of installation and maintenance of a sonar would be prohibitive due to the sheer number of possible spawning areas.

D. Actual In-Season Harvest Management

1) Quotas

After all of the calculating is finished and a preliminary forecast is done, the season is beginning. The Department of Fish and Game has several different methods of managing the harvest of Alaska's commercial fisheries during the actual season. The most basic of these is to impose a quota system upon the fishermen. Quotas can also be imposed by the canneries and/or processors in the area for the main reason that they do not have the facilities to process more than a certain amount of fish from any given fisherman.

2) Set Openings & Closings

The management practice that receives the most use throughout the State is that of a combination of set openings and closures with emergency order, day-to-day management.

3) Communications

Emergency order issuance can depend upon one or more of several factors: communication with upriver, subsistence or on-the-scene fishermen, canneries and/or processors, test fishing by Fish and Game staff on site, calculations on previous trend averages, hatchery data and any other factors that could give up to the minute, accurate ideas of run size and escapement.

4) Gear Size Regulations

Another type of management in the same class is the establishment of gear size regulations. Since it is possible to segregate catches by using different size mesh in nets, a mesh size regulation is imposed. Then, to regulate catch size, a regulation governing maximum net length, depth and aggregate size can be imposed. All areas where net fishing occurs now use the maximum aggregate regulation as opposed to sliding gear method, i.e. restriction on the fathoms of nets.

5) Problems

There are still many problems with the management of Alaska's commercial fisheries which still result in sometimes crecial over or under escapement in areas not able to provide adequate spawning area for the spawning salmon or where there is too much gear in the water.

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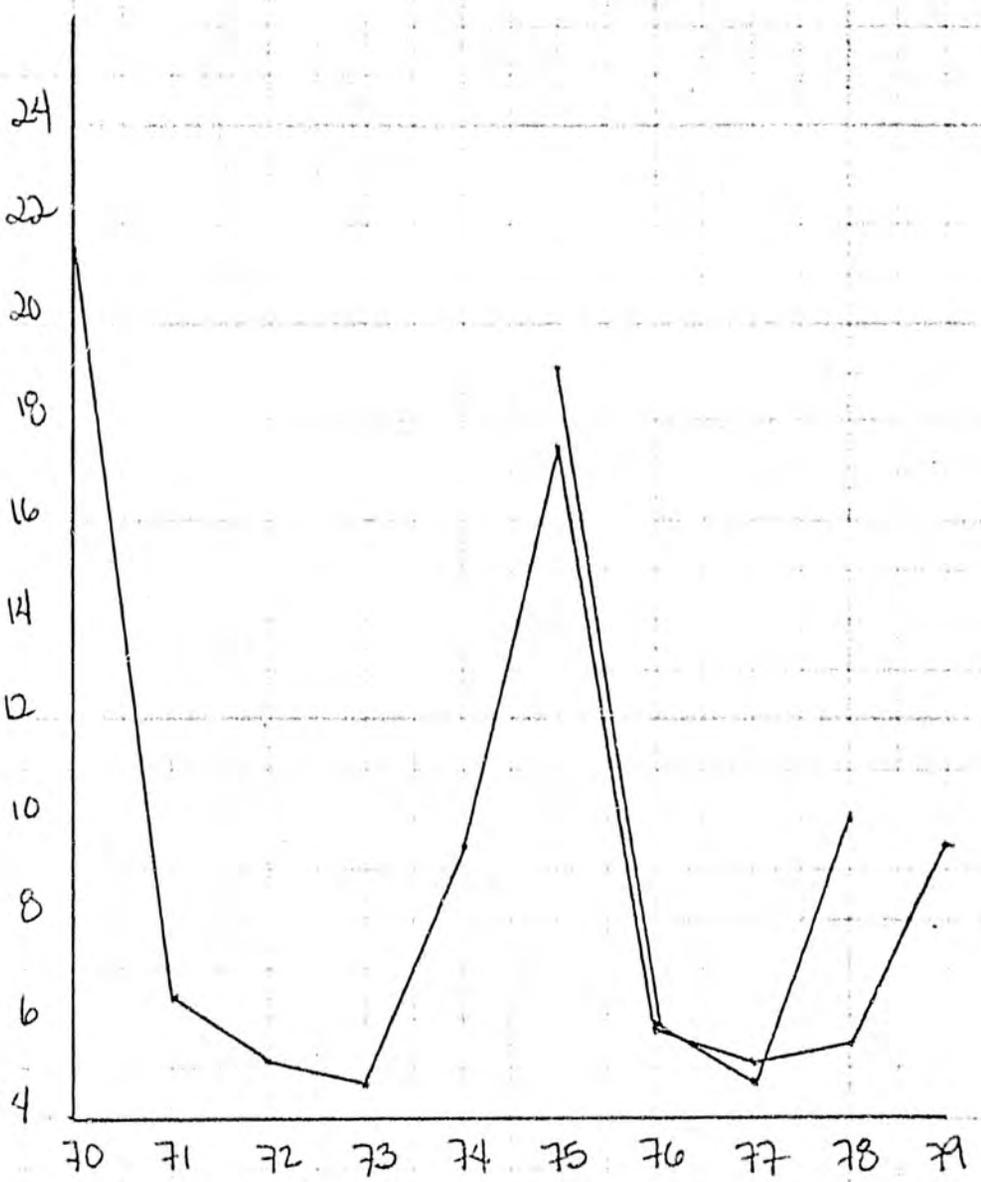
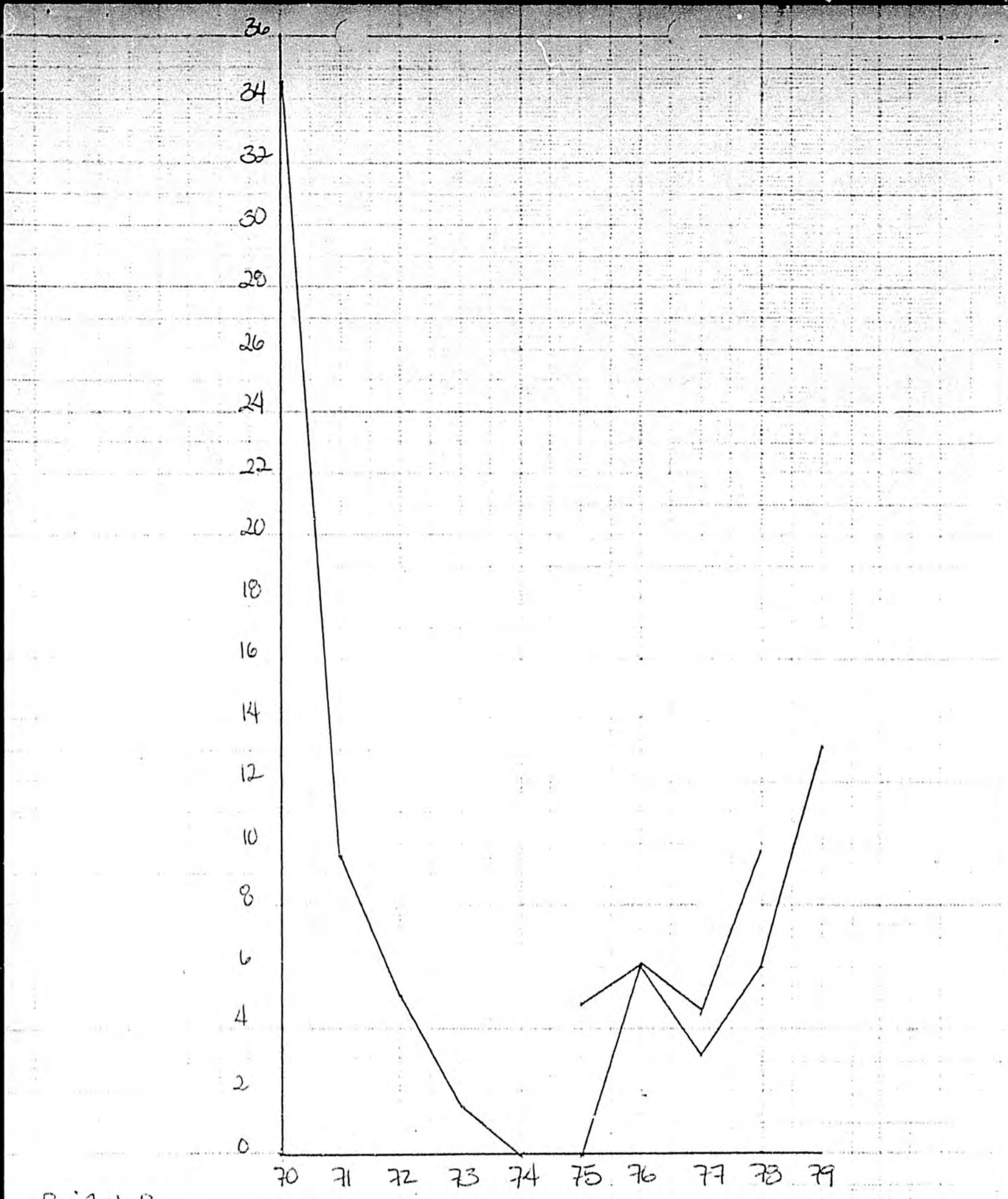
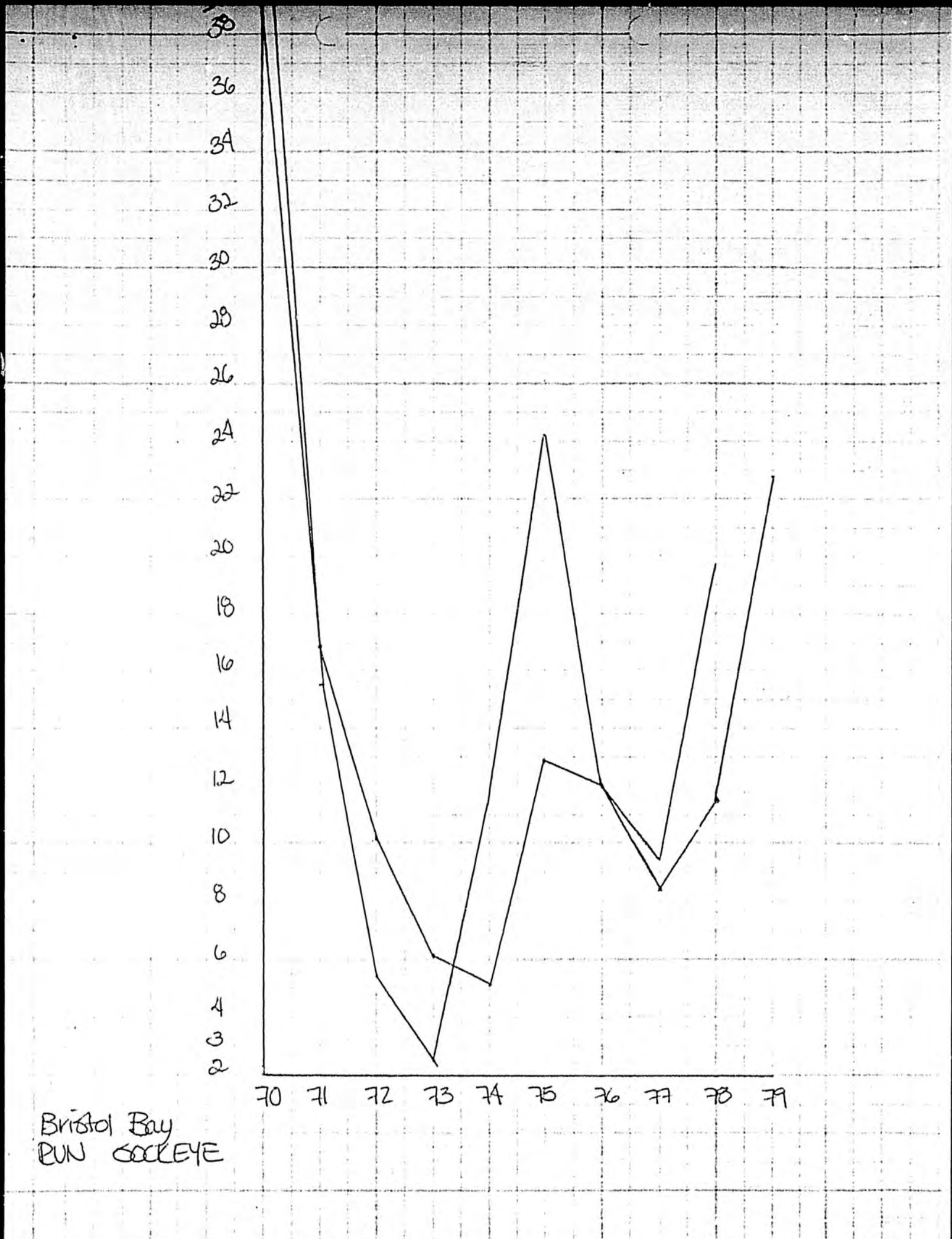


Bristol Bay
ESCAPEMENT SOCKEYE



Bristol Bay
HARVEST SOCKEYE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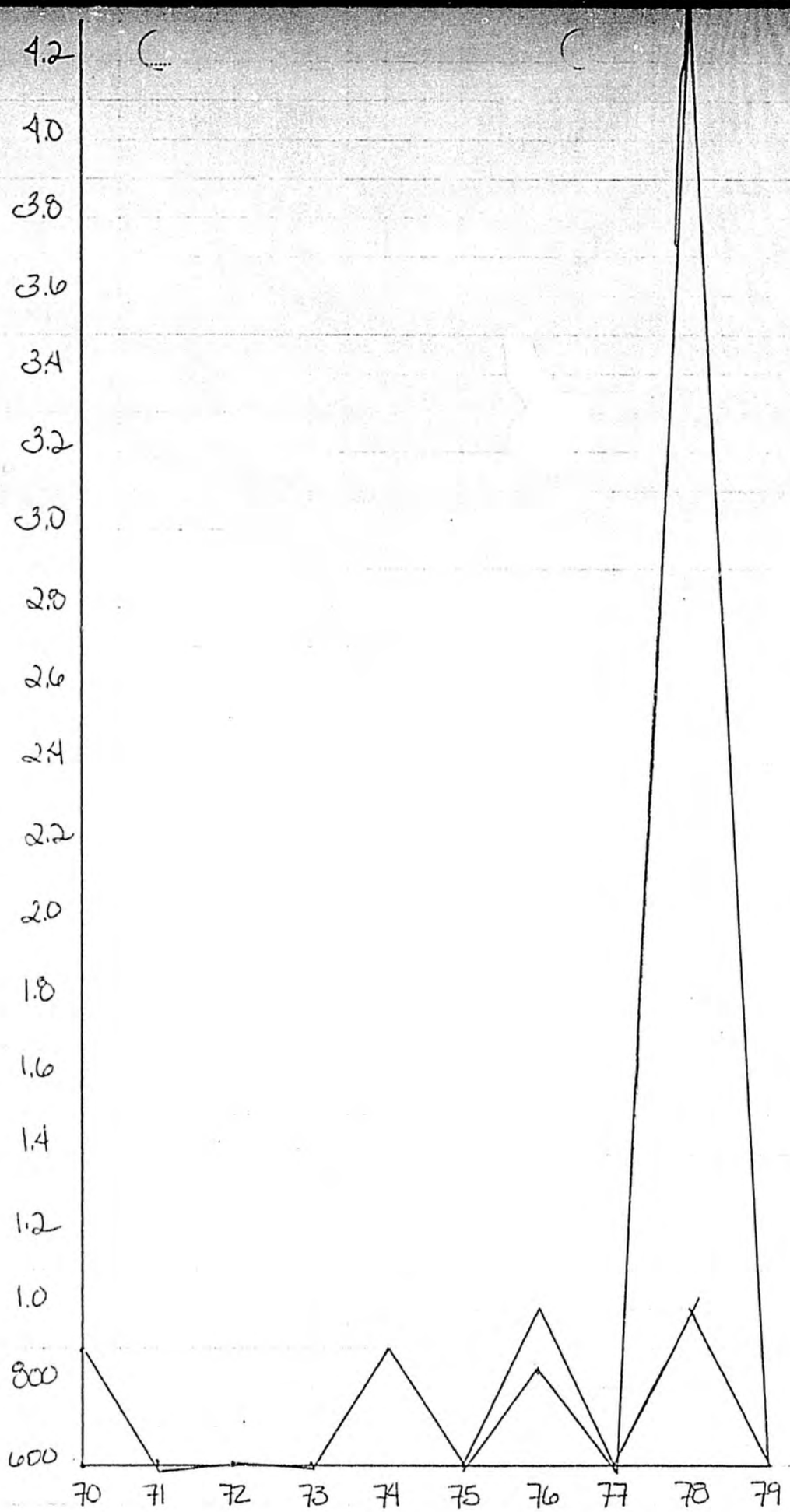
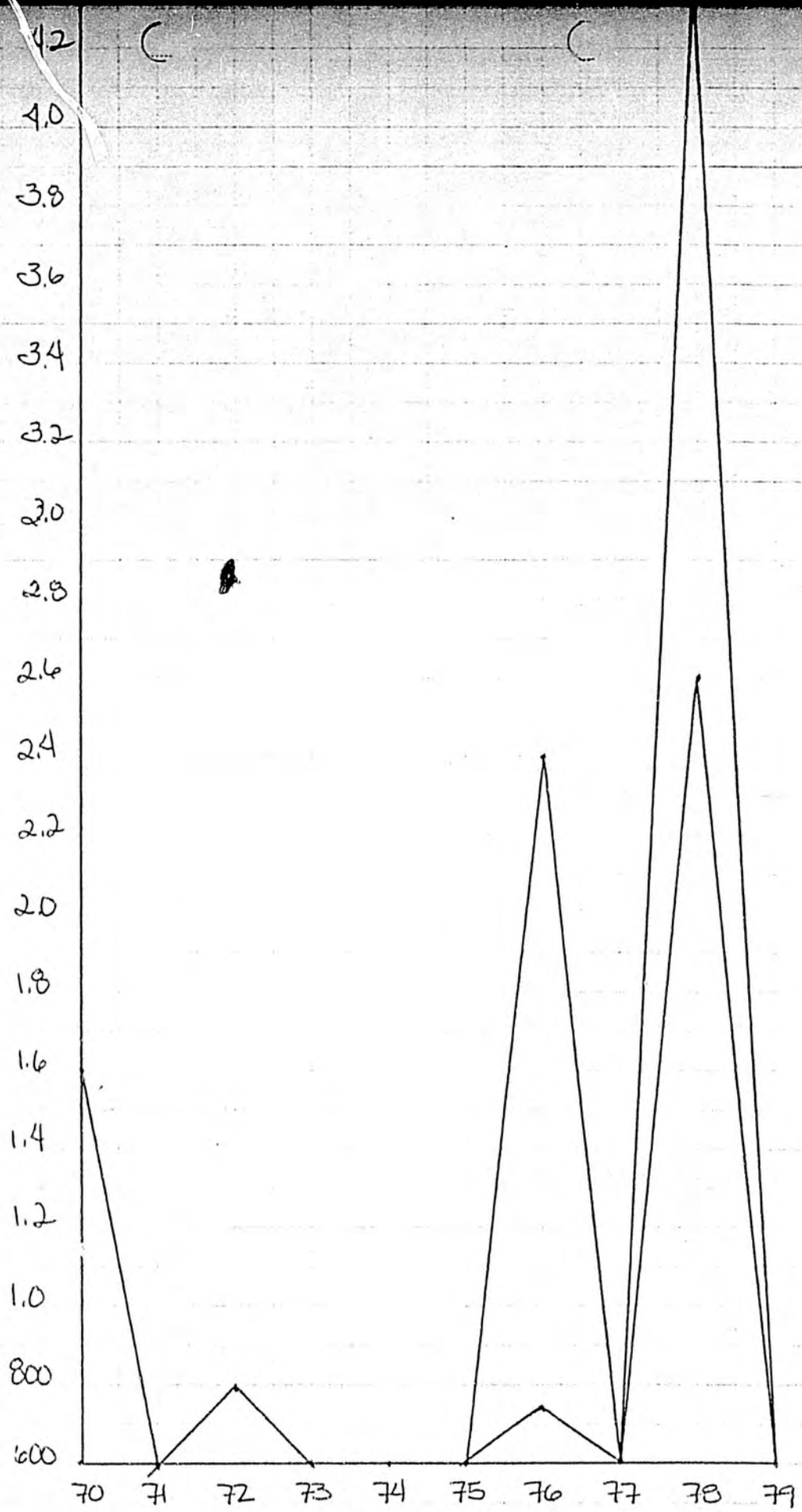
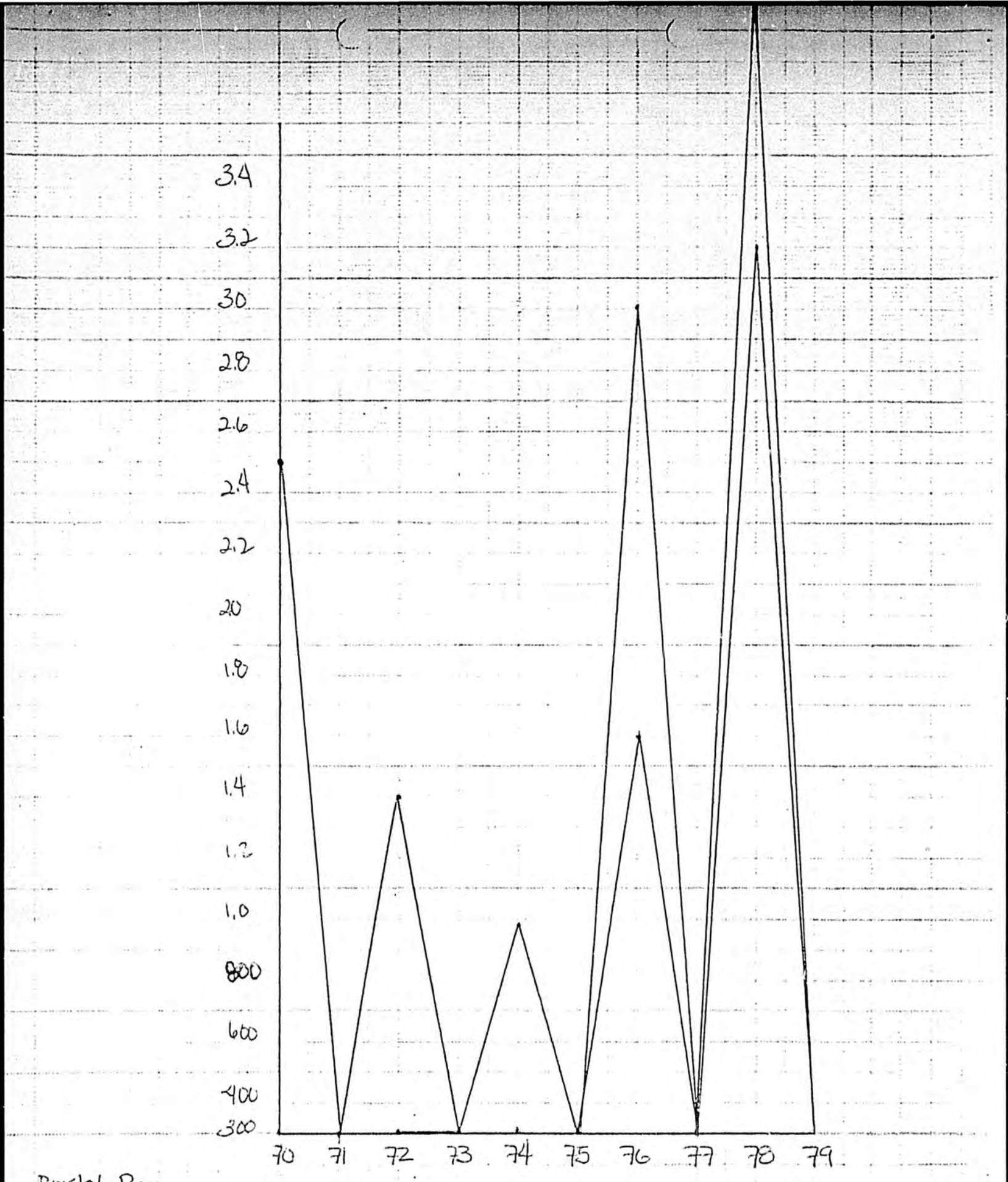
Bristol Bay
RUN COCKEYE



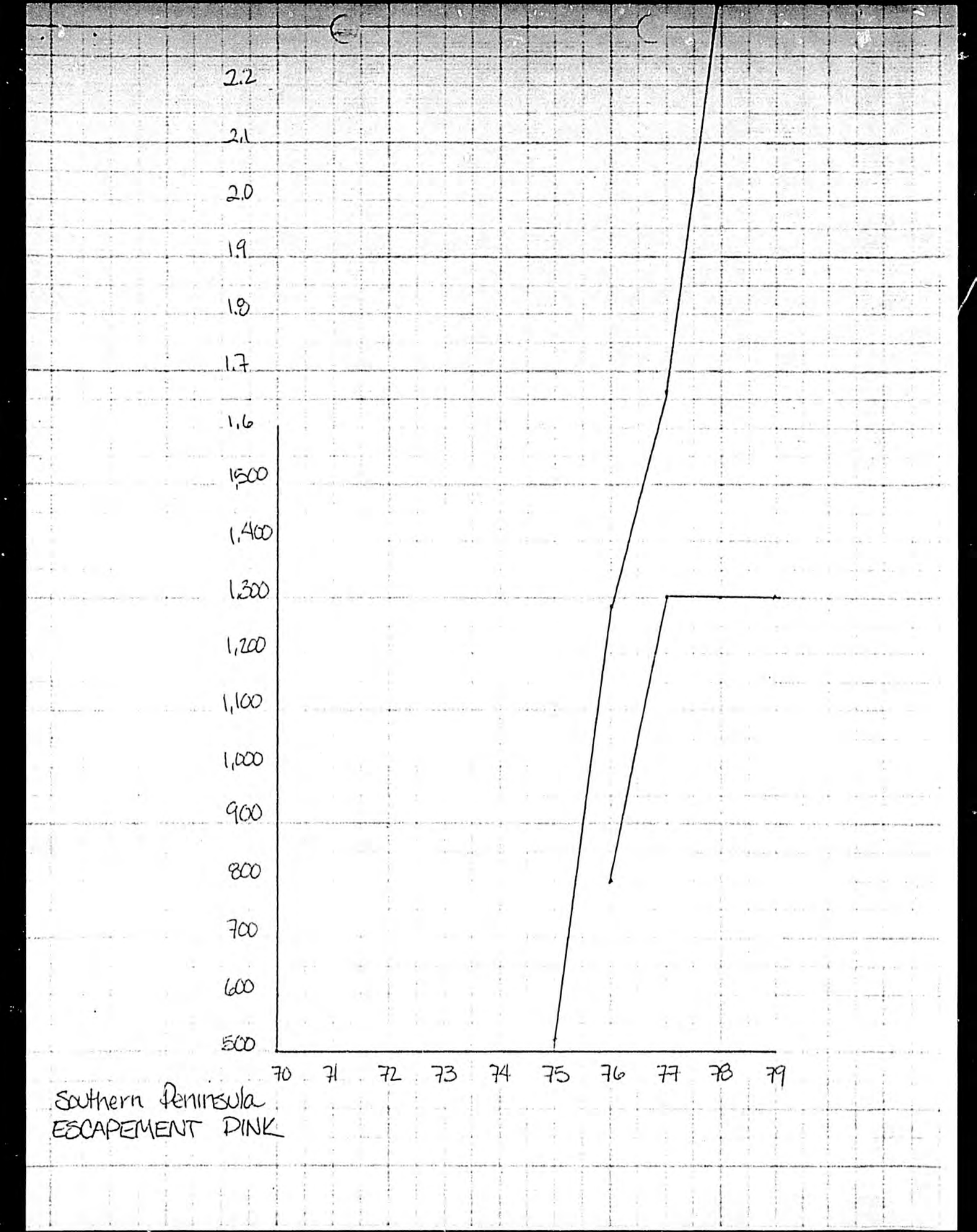
Bristol Bay
ESCAPEMENT PINK



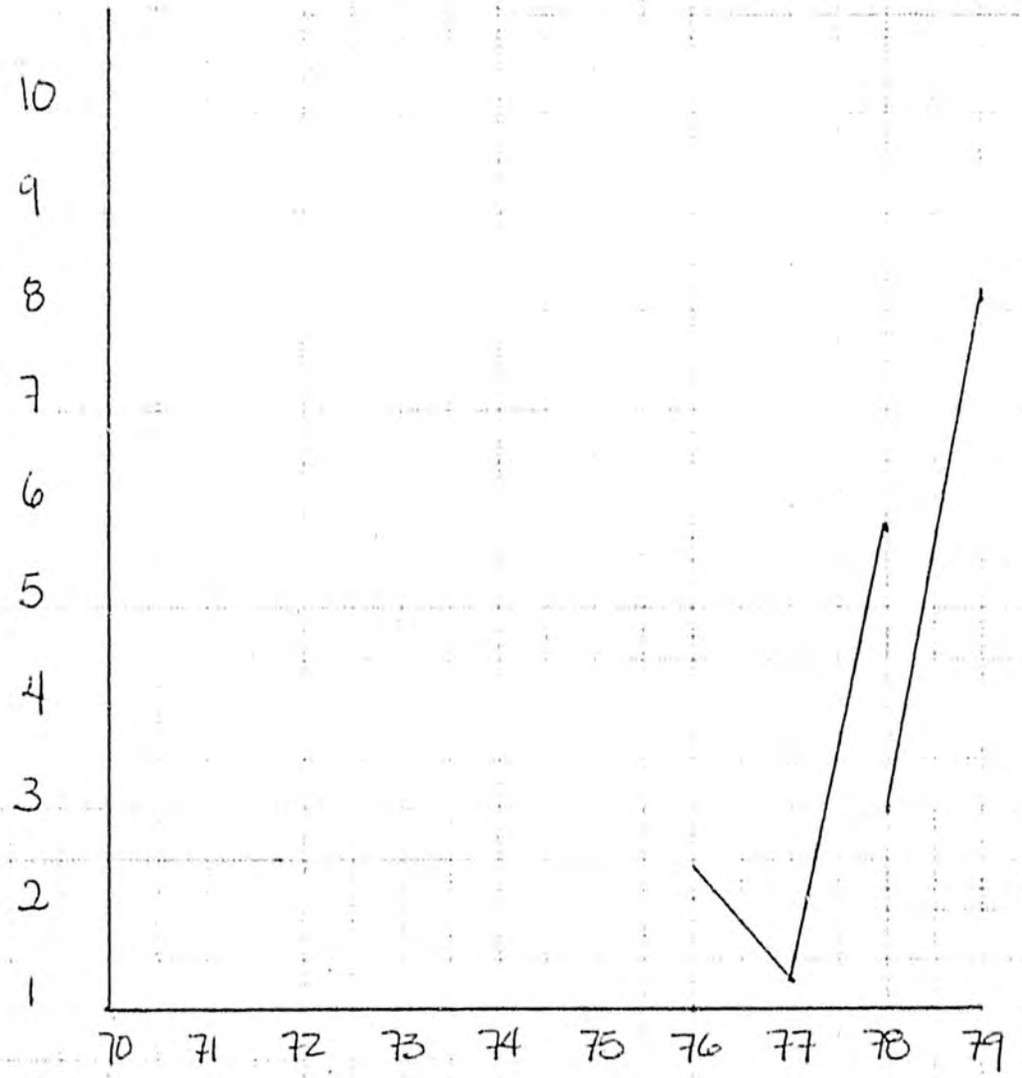
Bristol Bay
HARVEST PINK



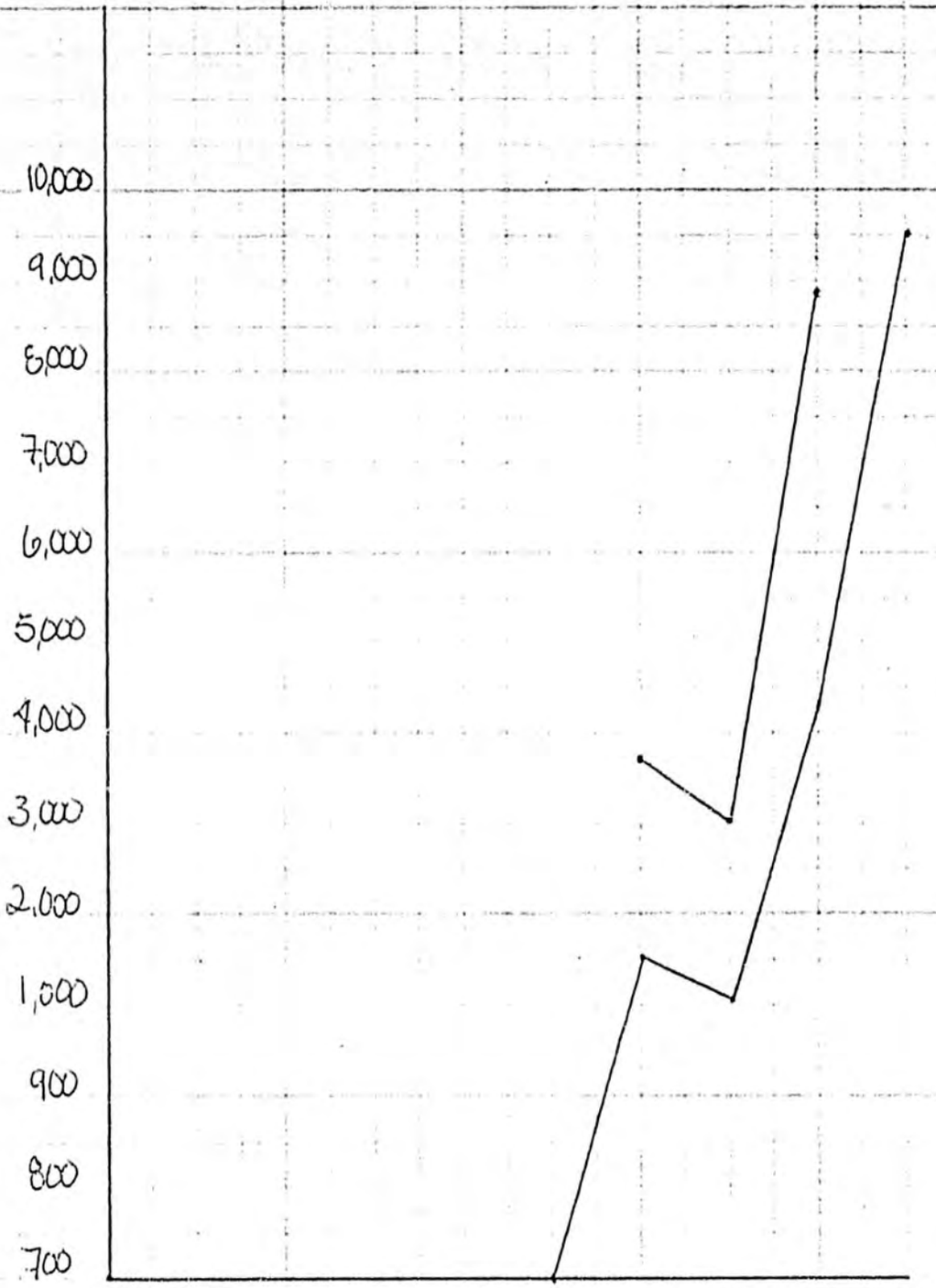
Bristol Bay
RUN PINK



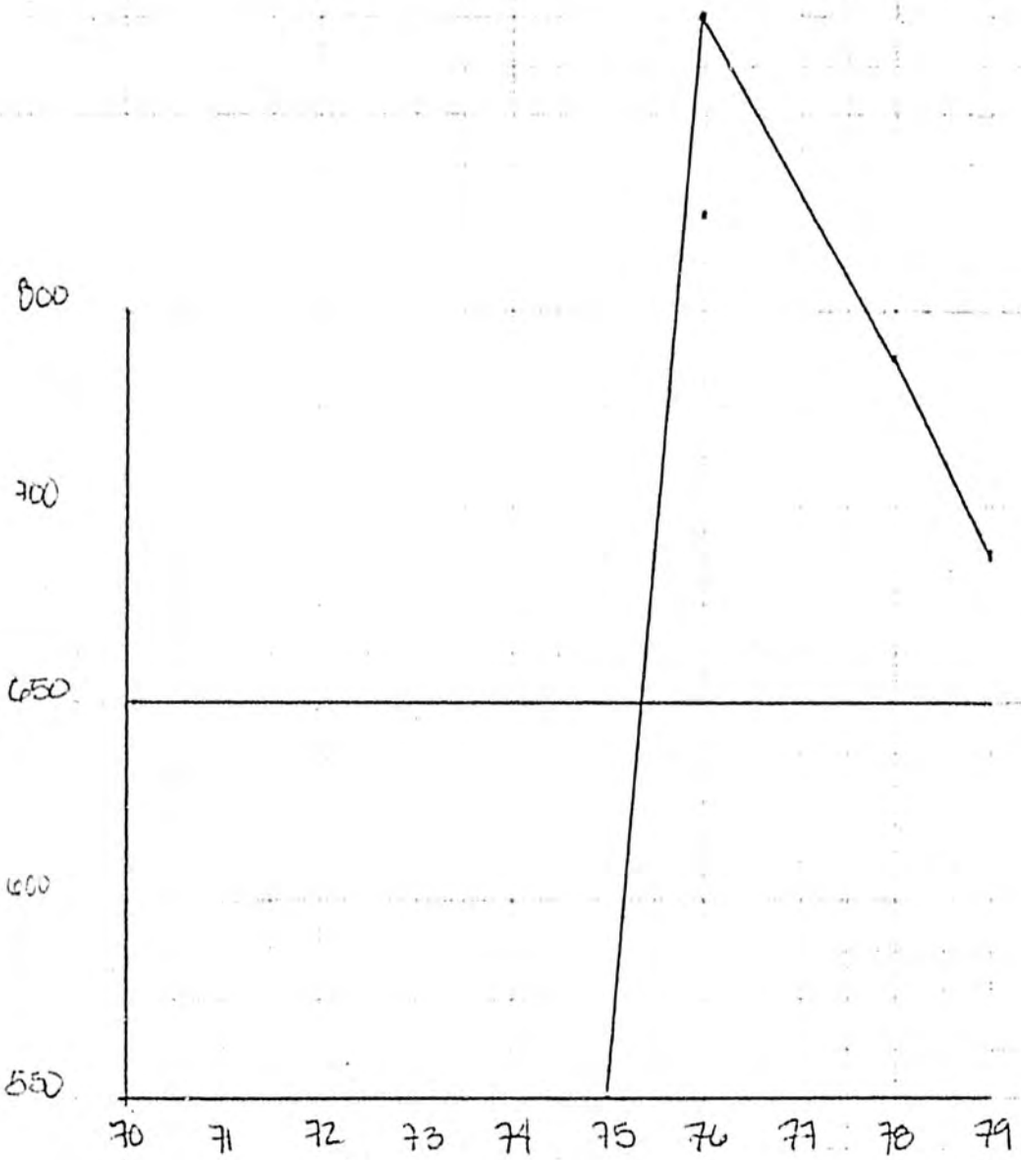
Southern Peninsula
ESCAPEMENT PINK



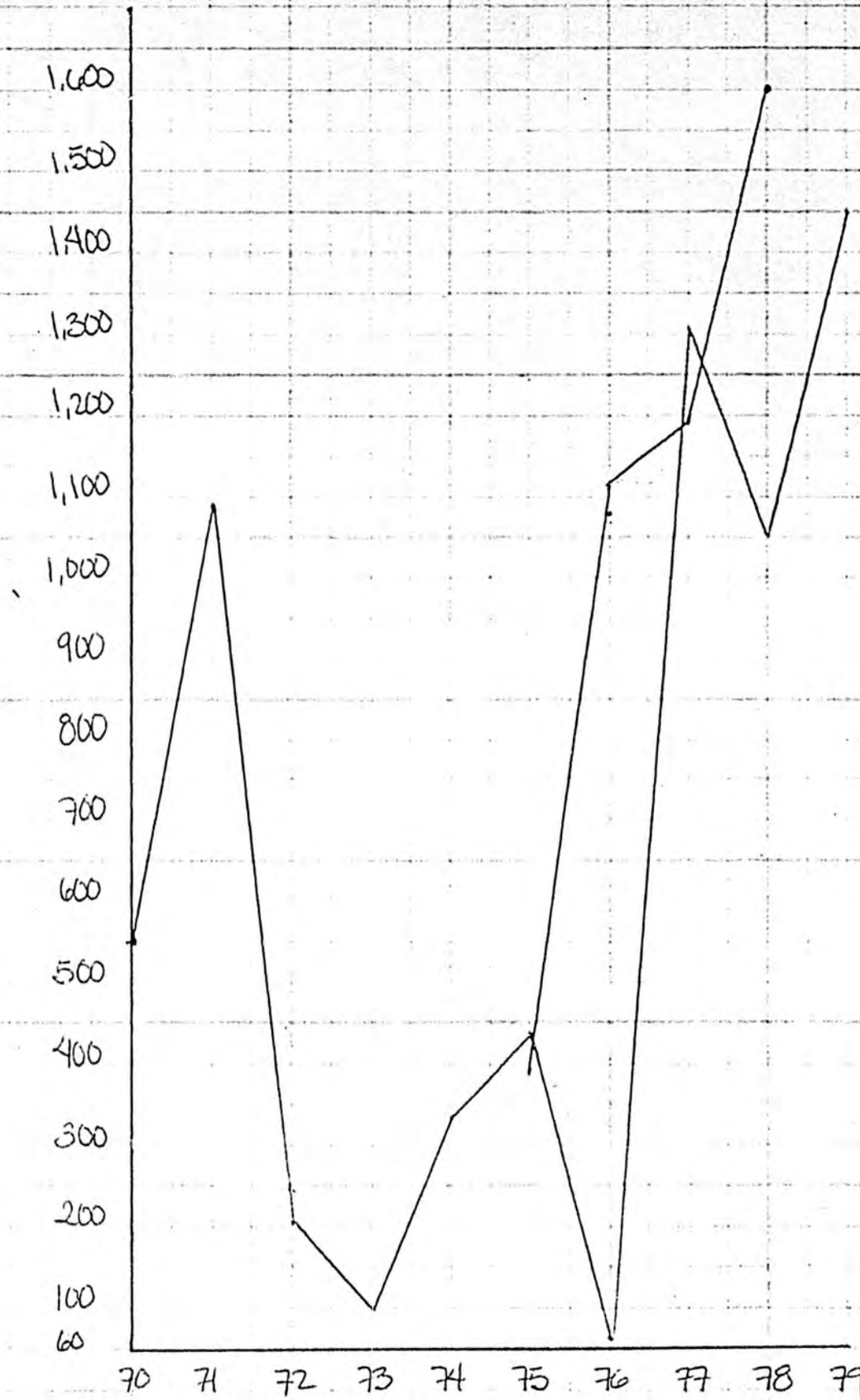
Southern Peninsula
HARVEST PINK



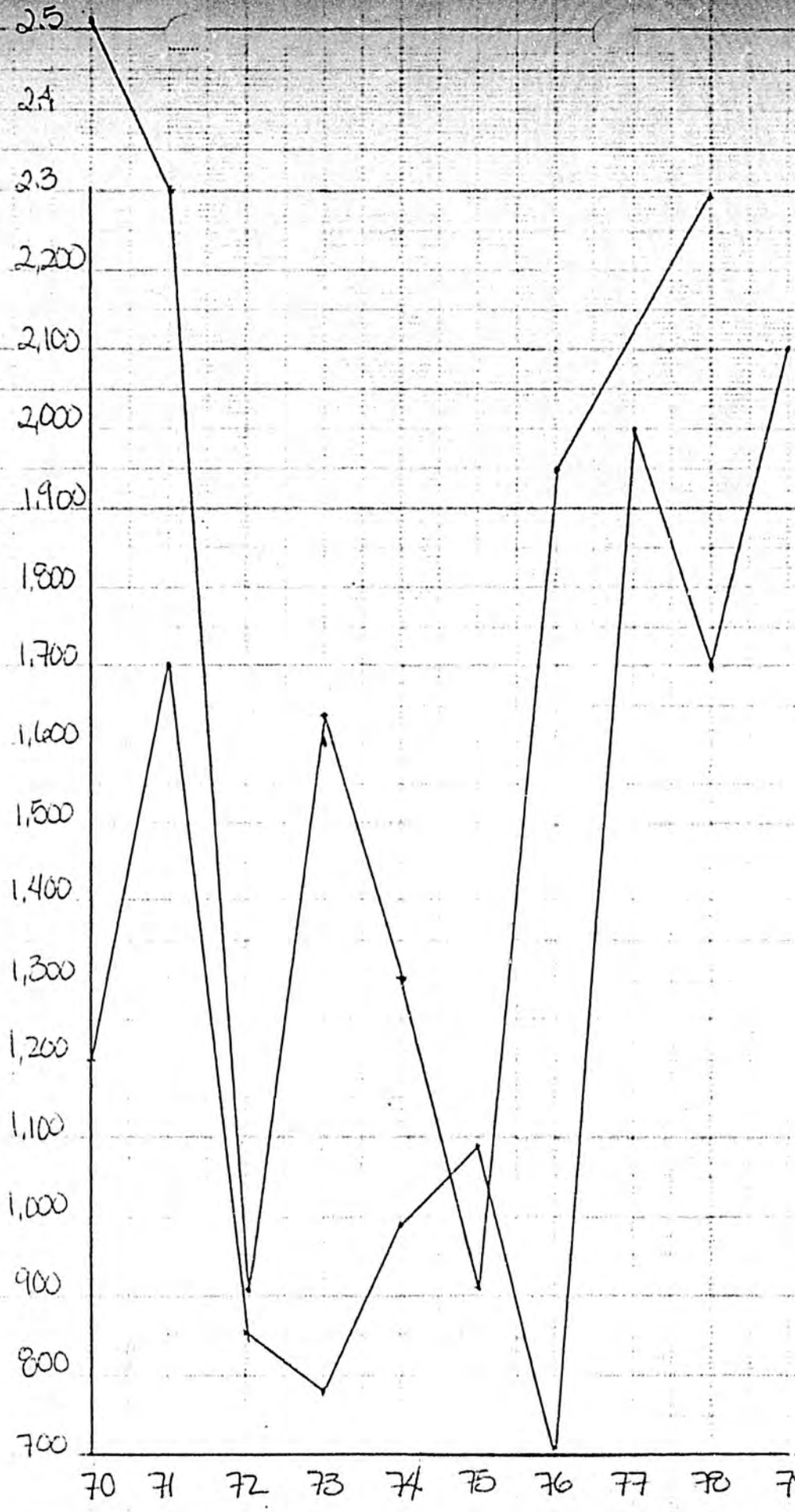
Southern Peninsula
RUN PINK



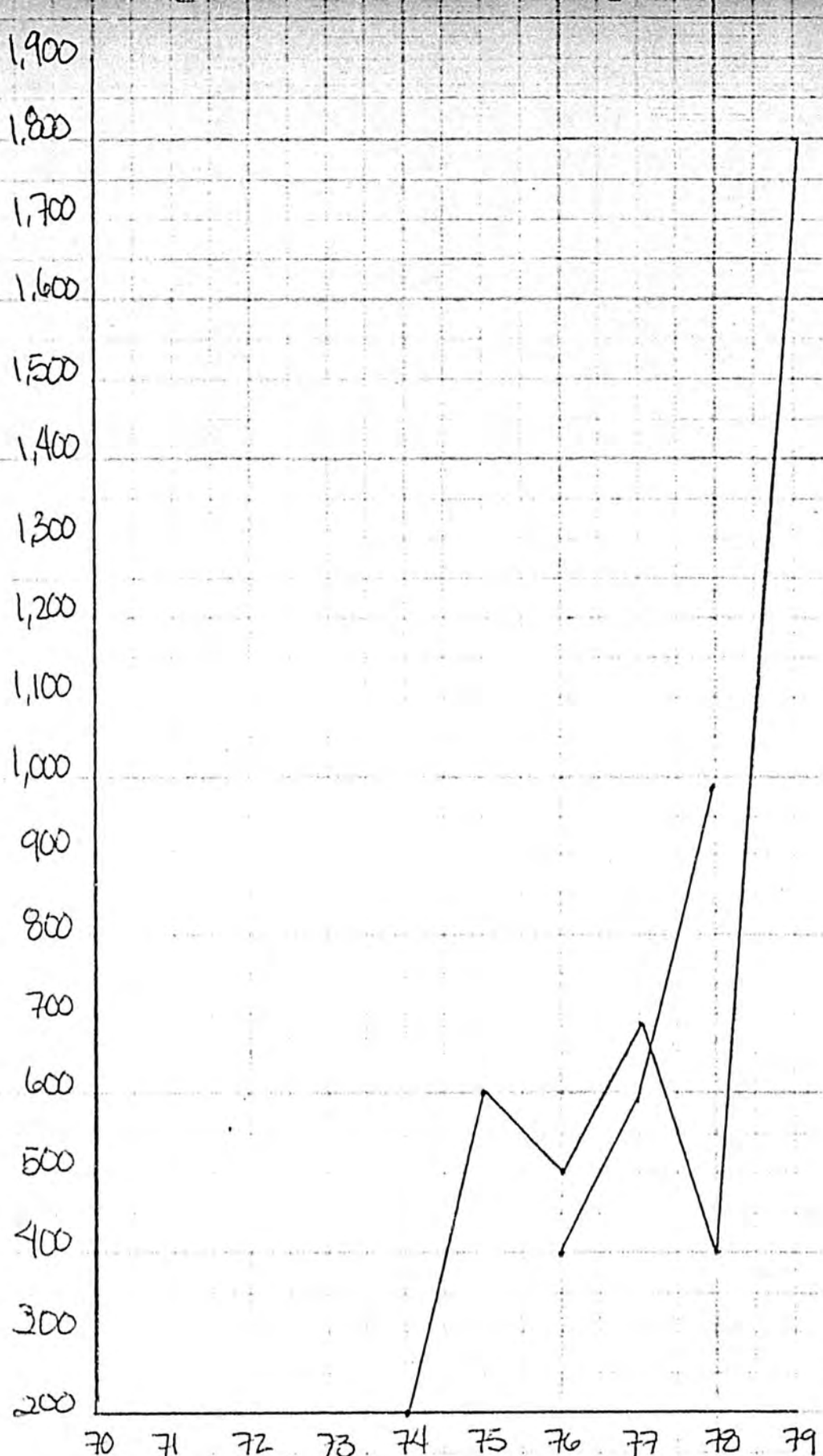
Chignik
ESCAPEMENT SOCKEYE



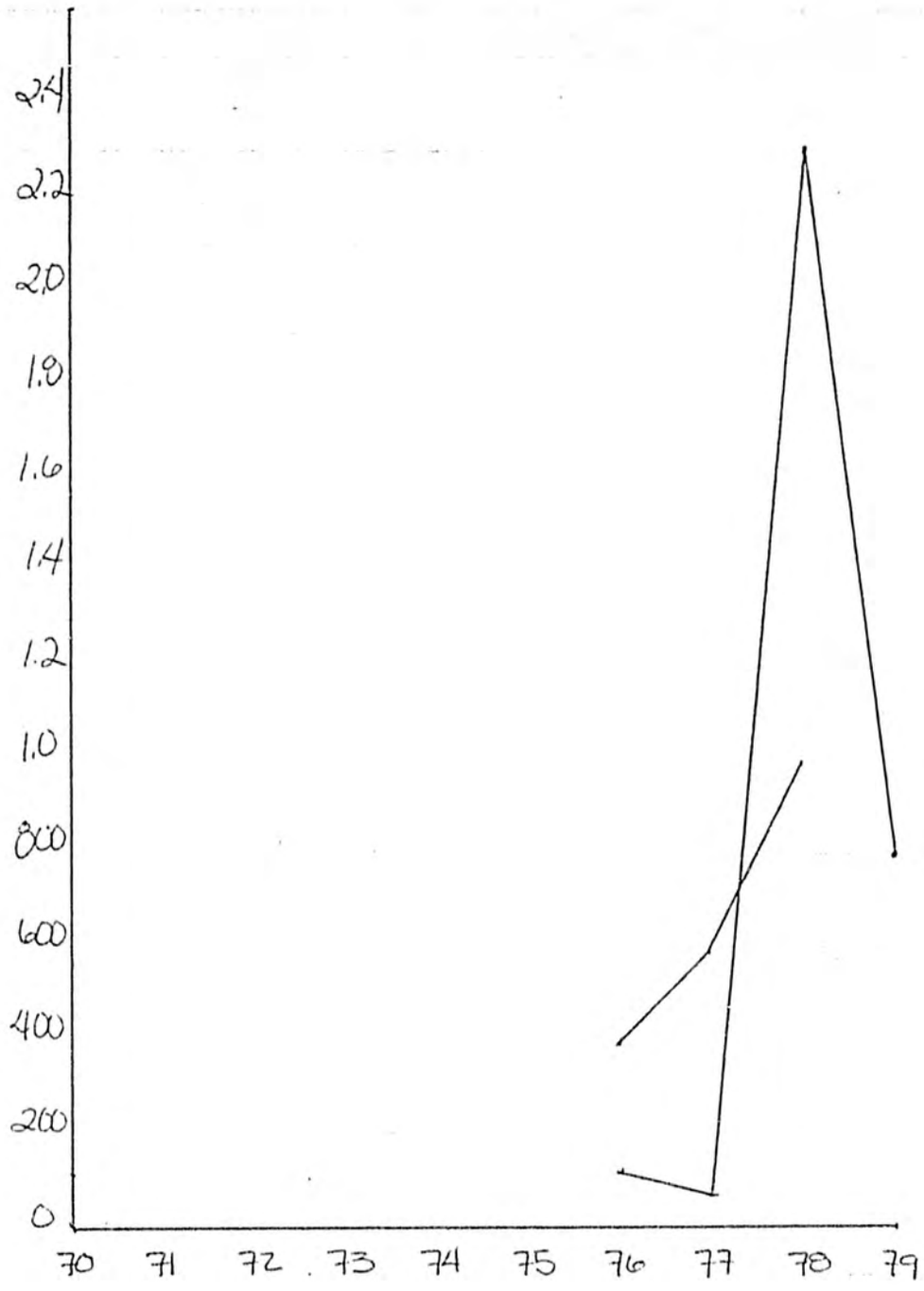
Chignik
HARVEST SOCKEYE



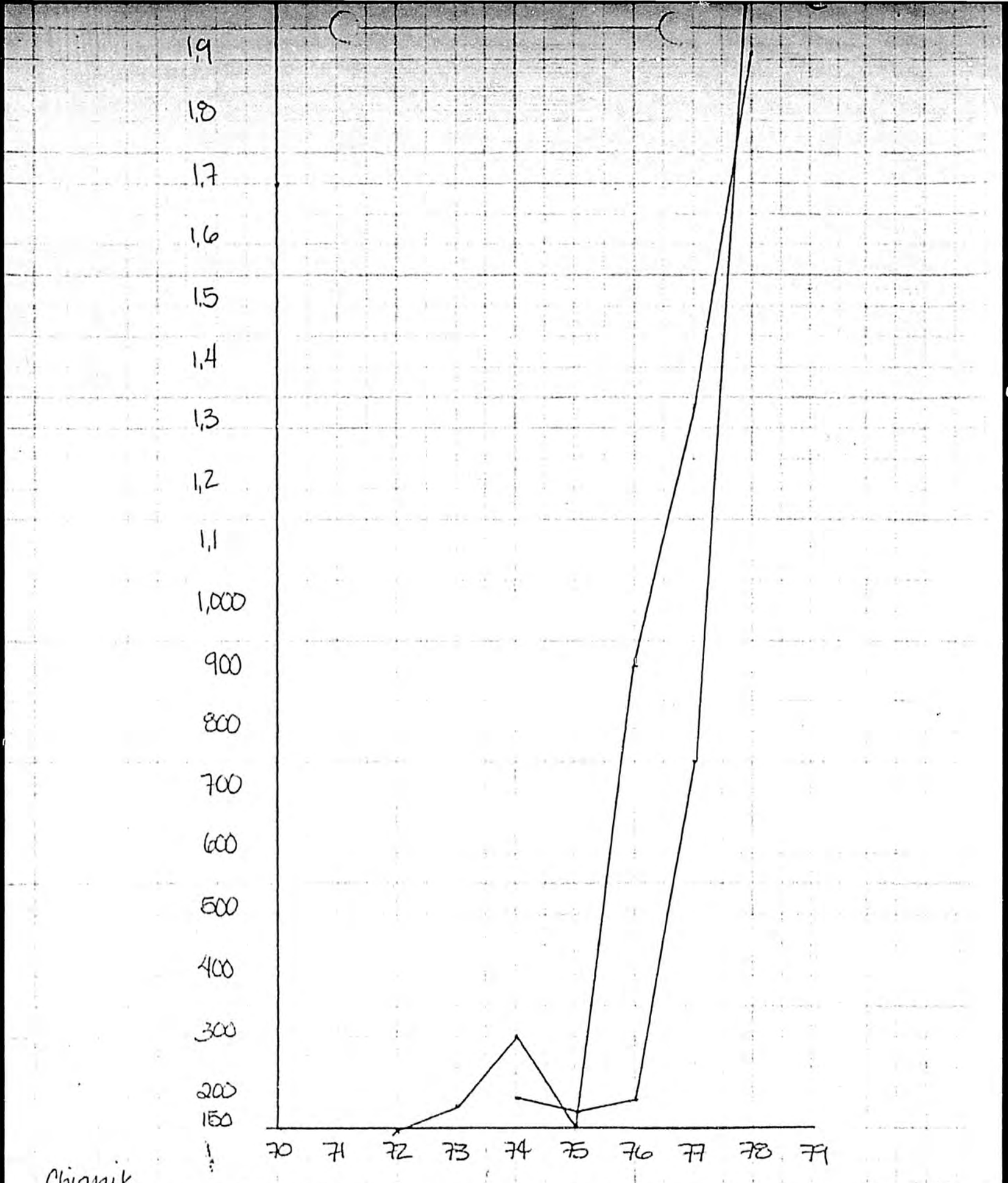
Chignik
RUN SOCKEYE



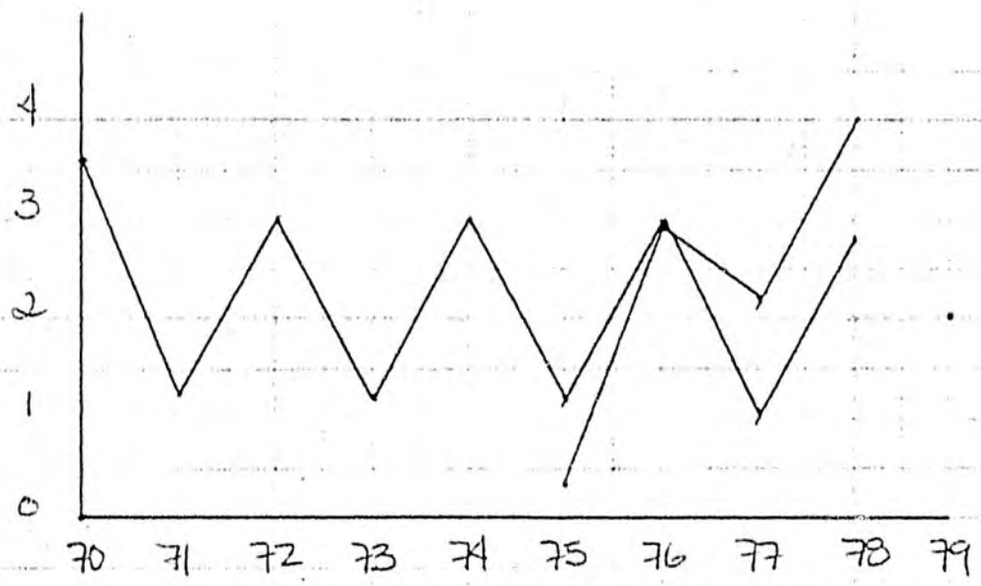
Chignik
ESCAPEMENT BANK



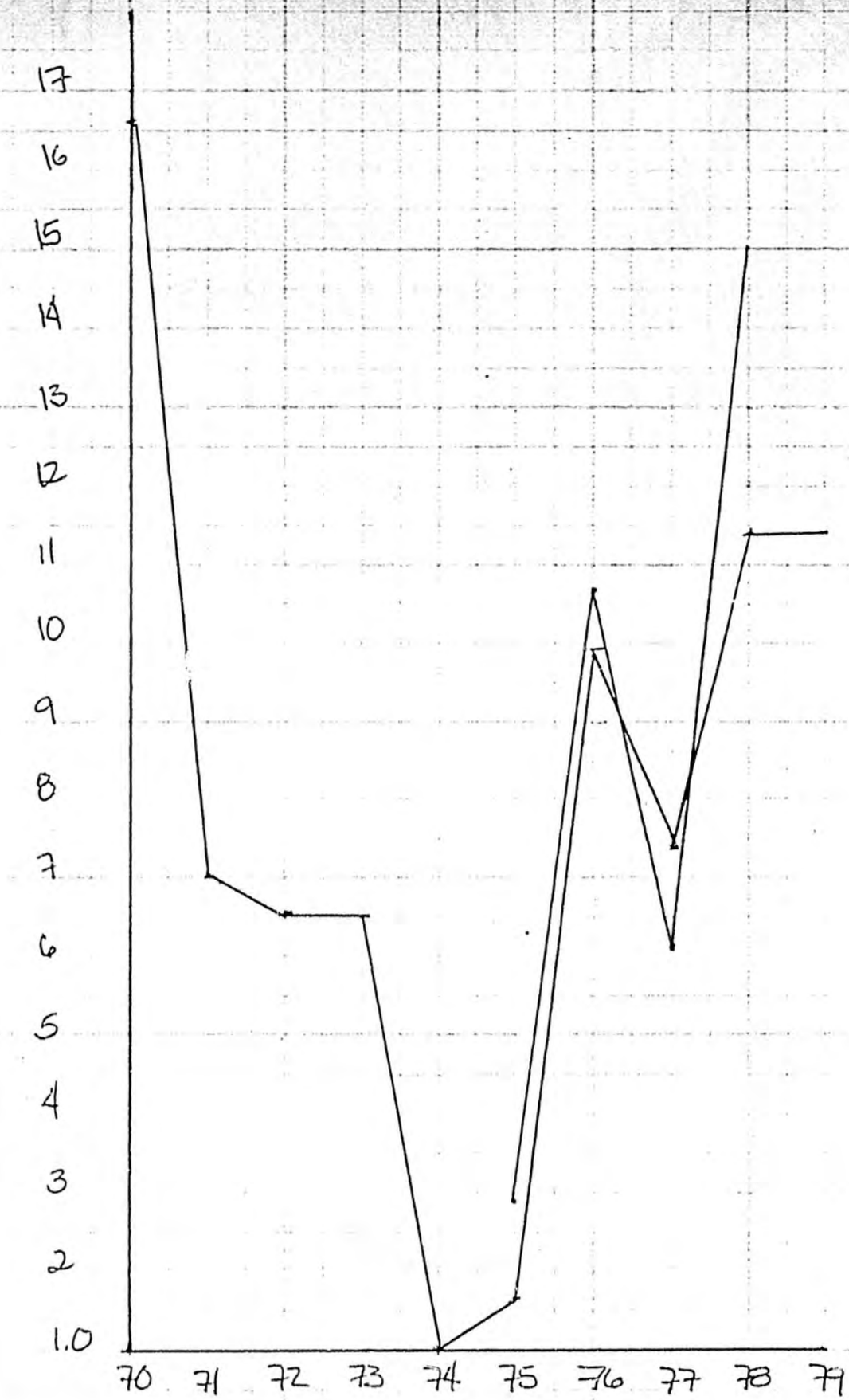
Chignik
HARVEST PINK



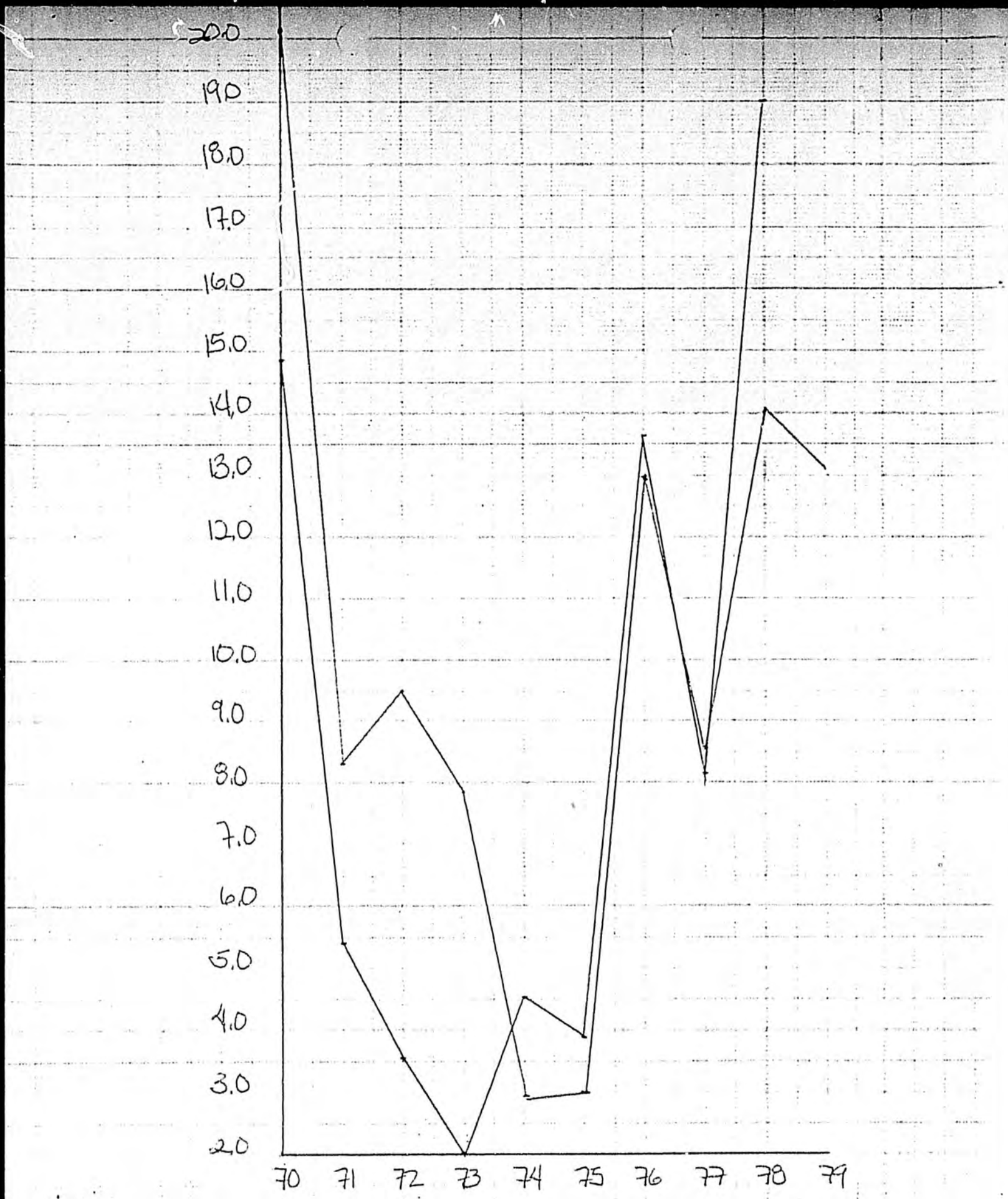
Chignik
RUN PINK



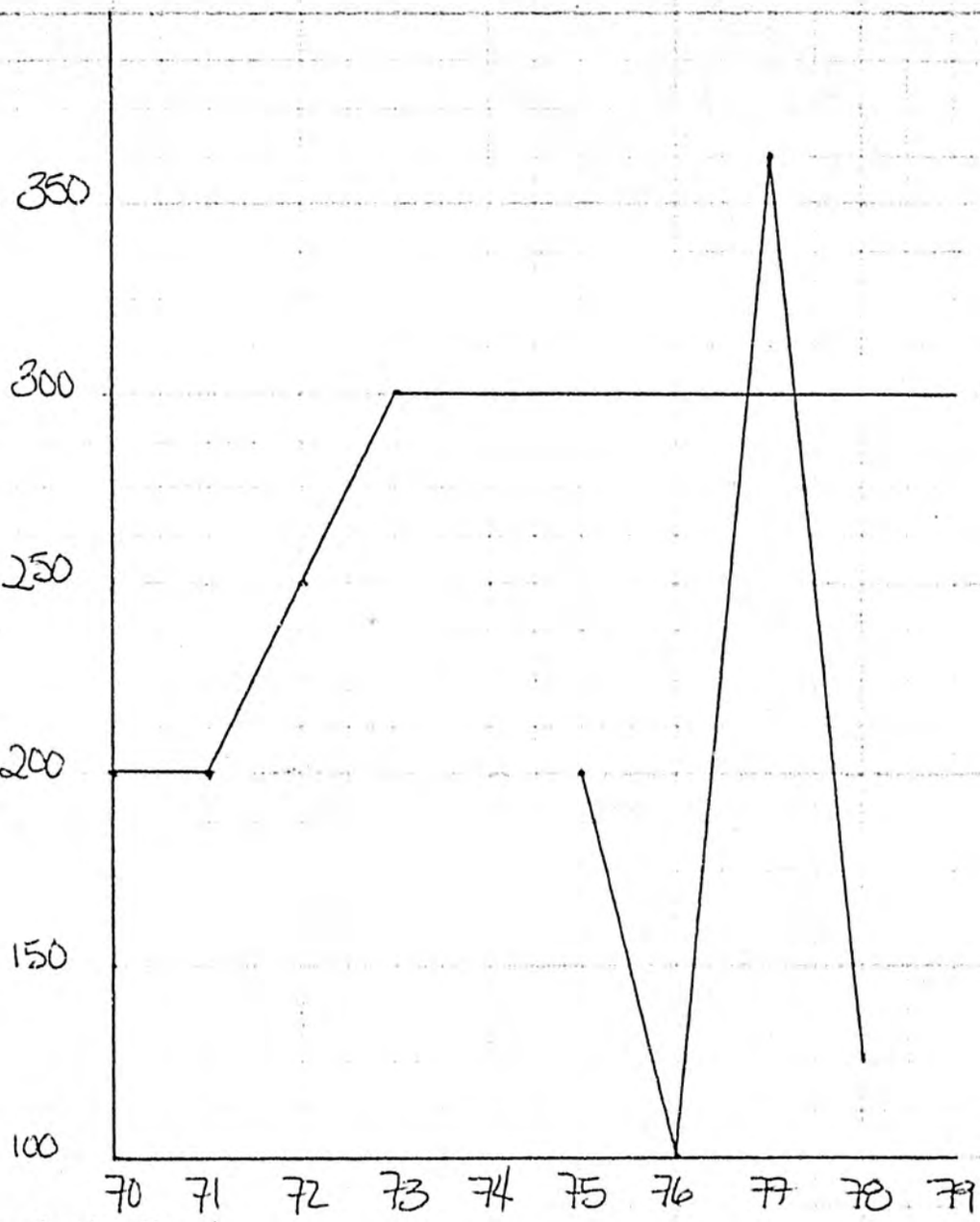
Kodiak
ESCAPEMENT PINK



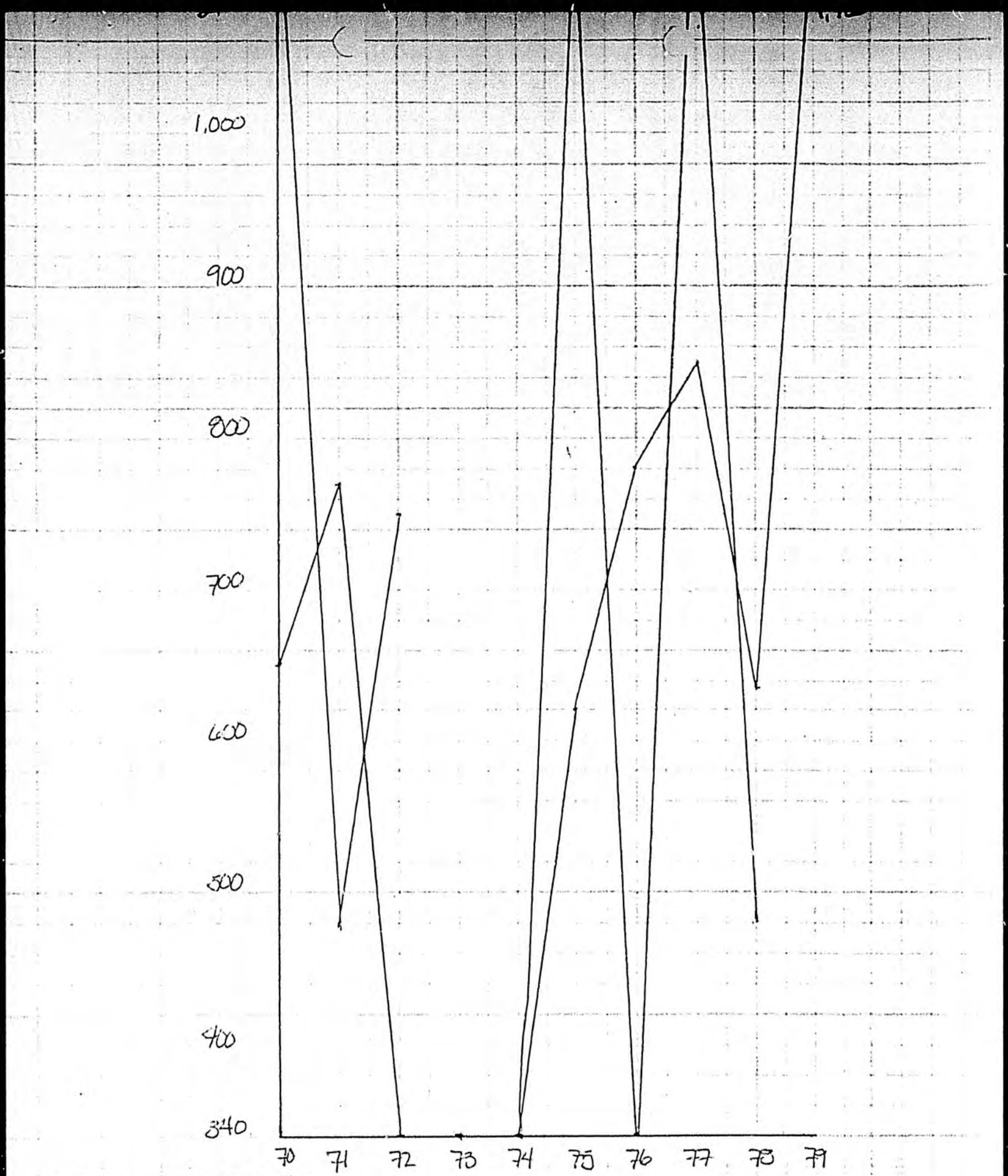
Kodiak
HARVEST PINK



Kodiak
RUN PINK

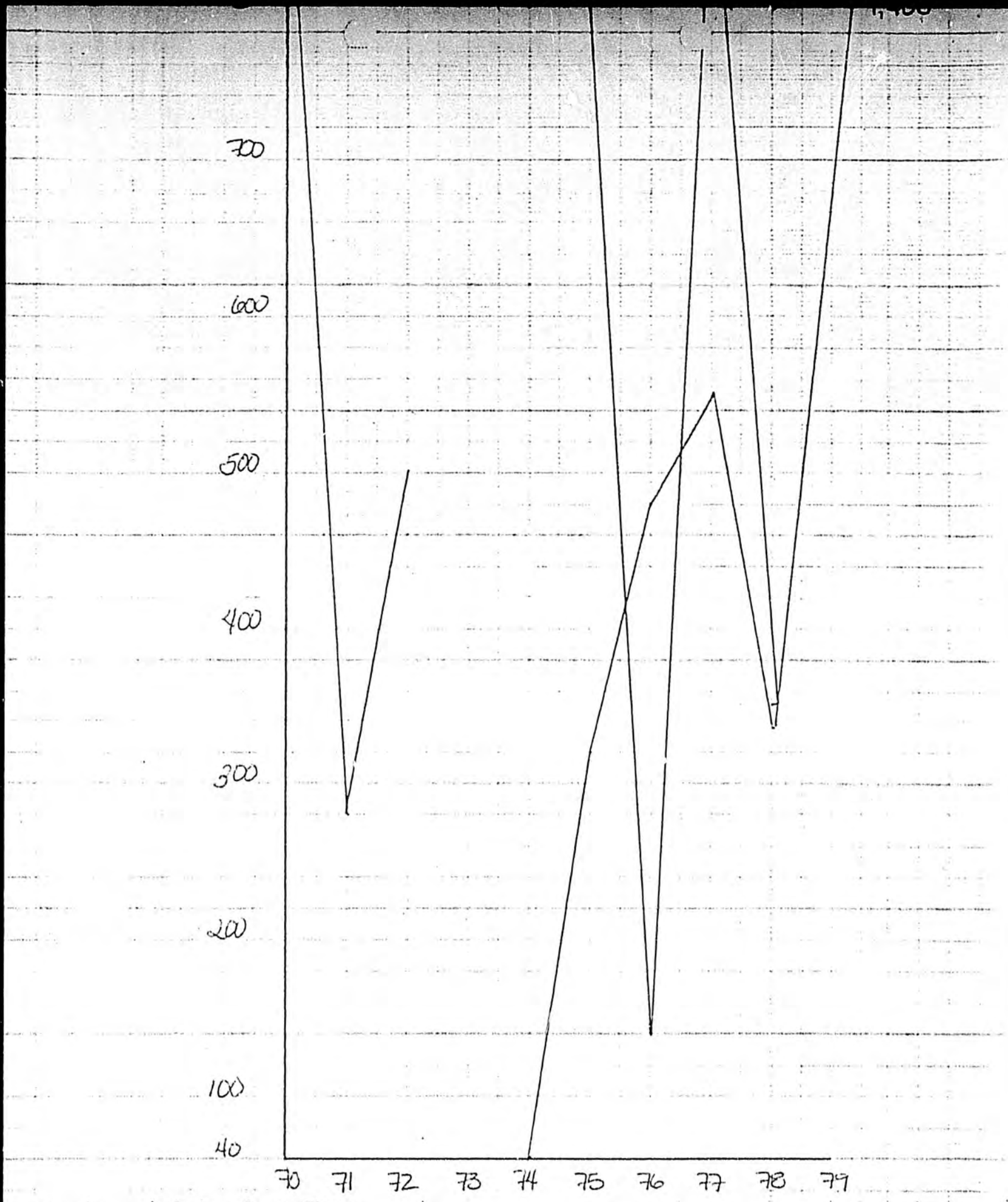


Southern & Outer Cook Inlet
ESCADEMENT PINK



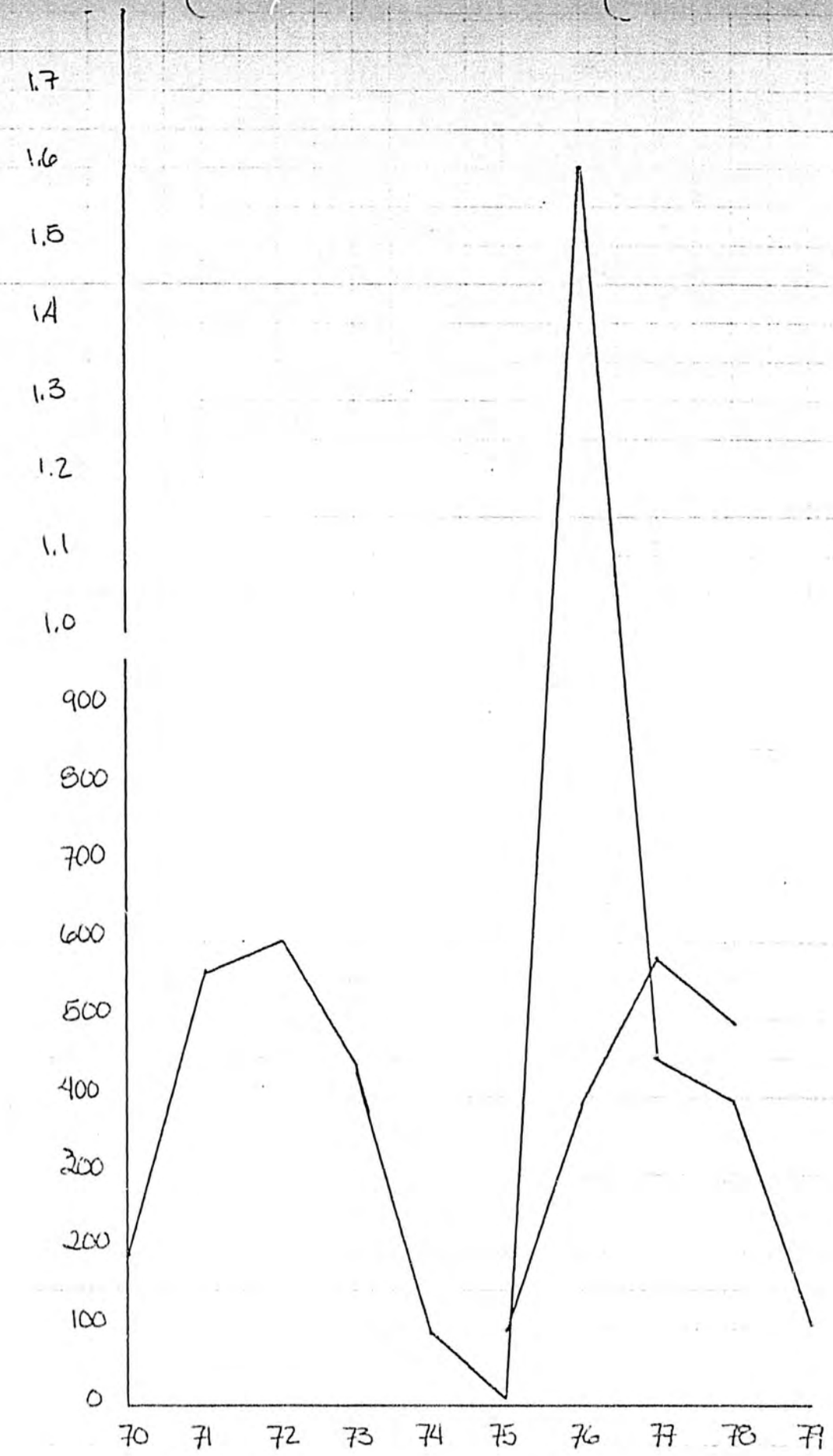
Southern & Outer Cook Inlet

RUN PINK

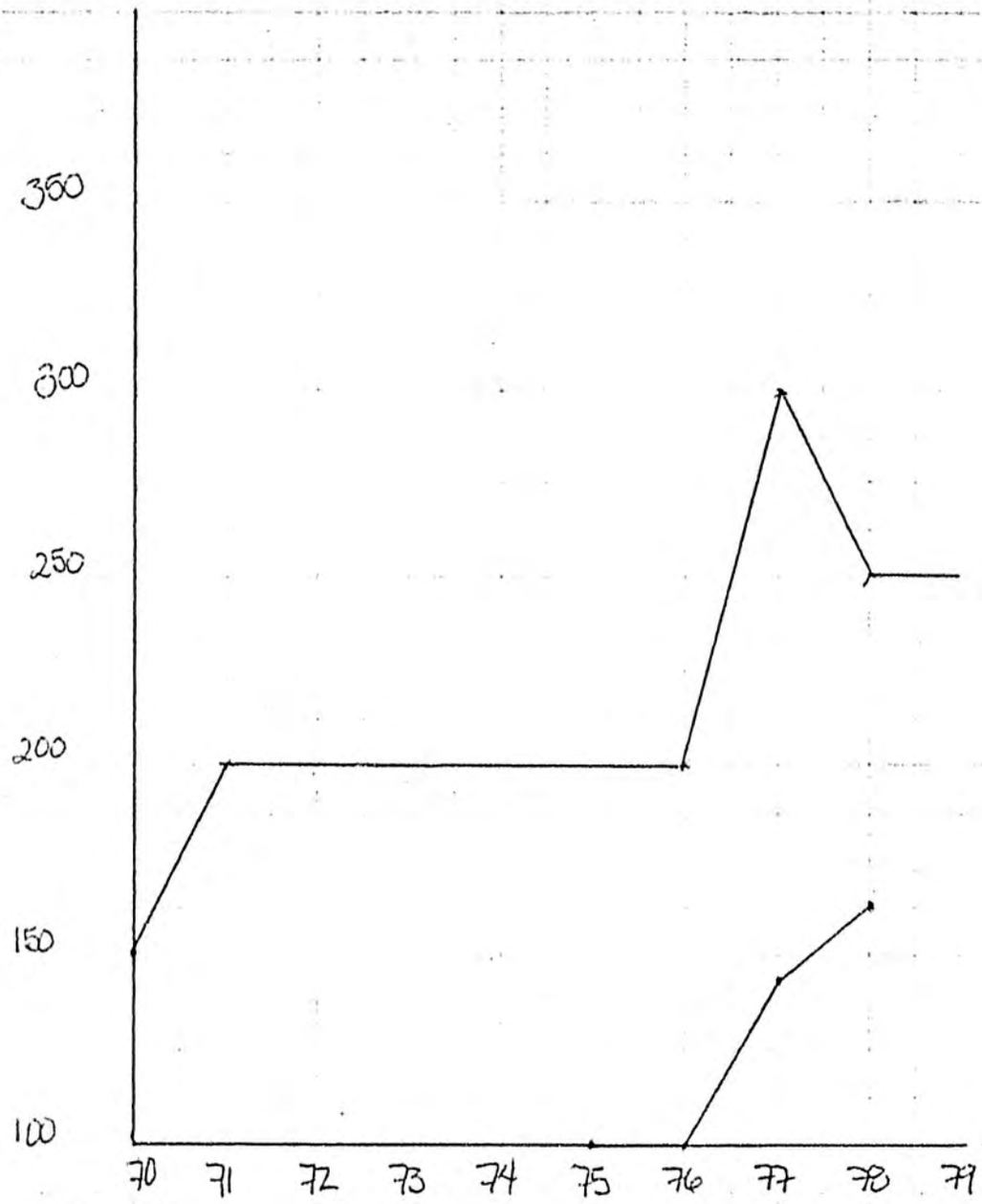


Southern & Outer Cook Inlet

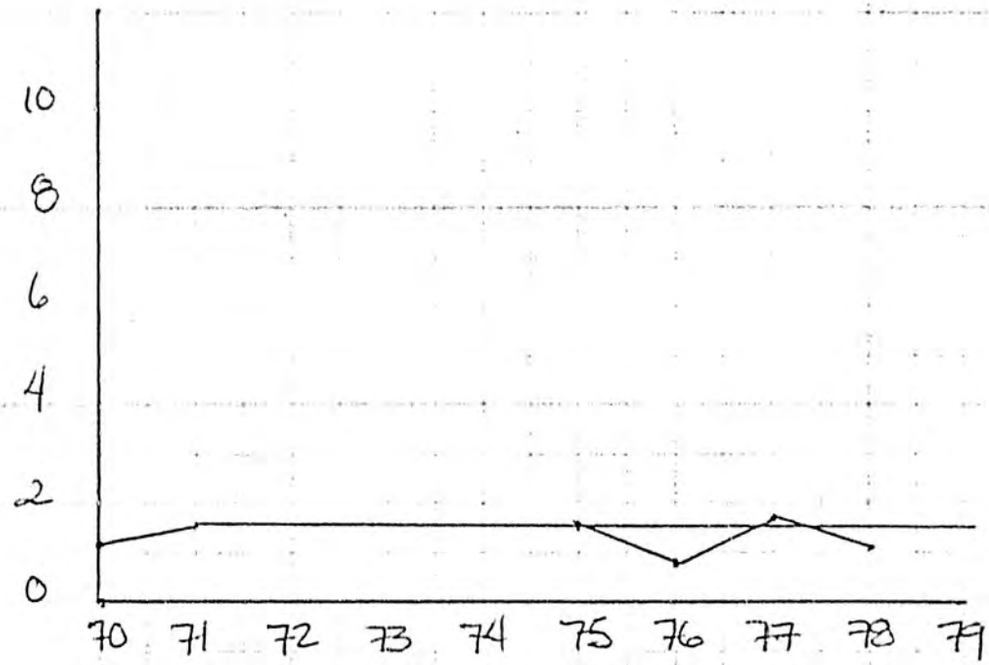
HARVEST PINK



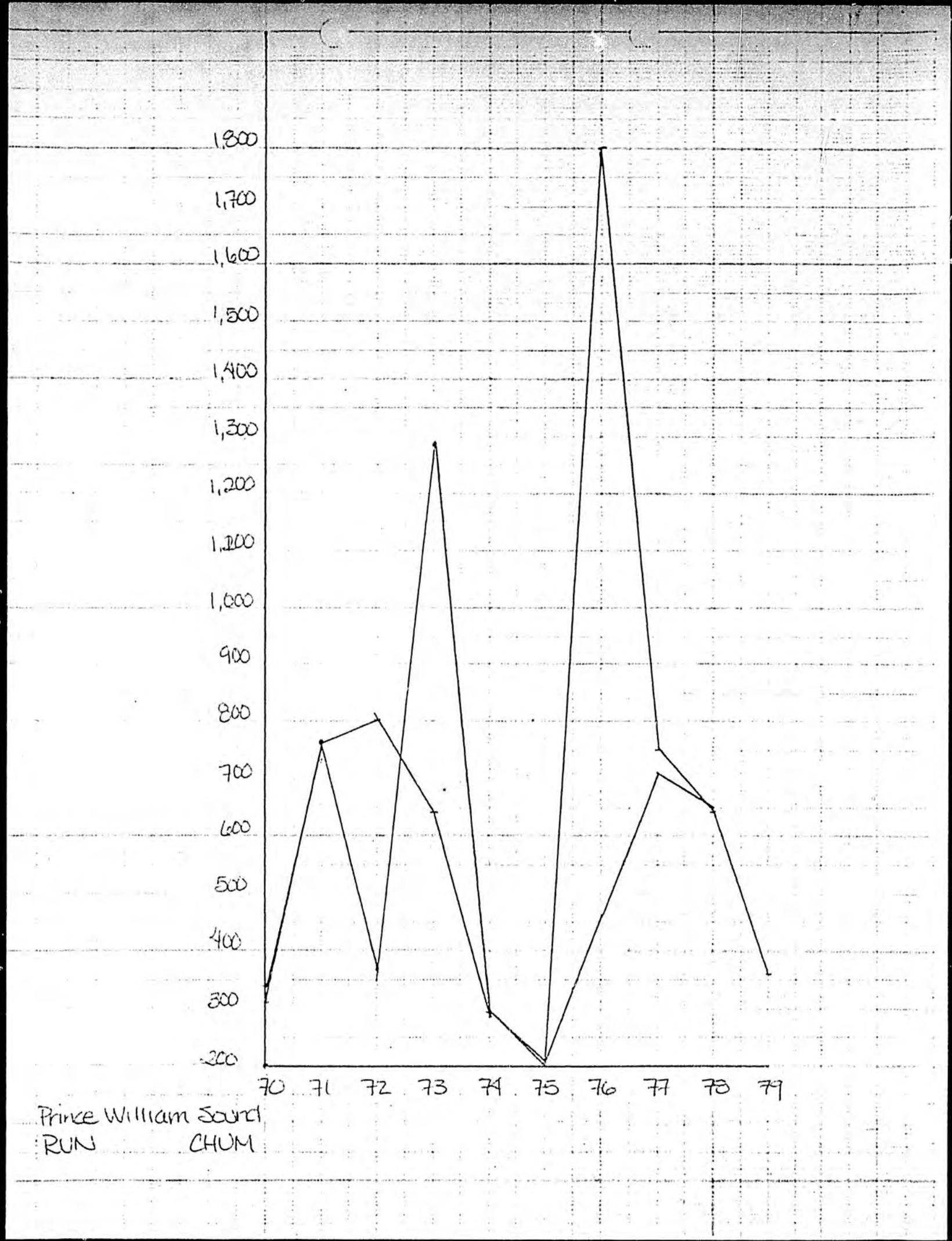
Prince William Sound.
HARVEST CHUM



Prince William Sound
ESCAPEMENT CHUM



Prince William Sound
ESCAPEMENT PINK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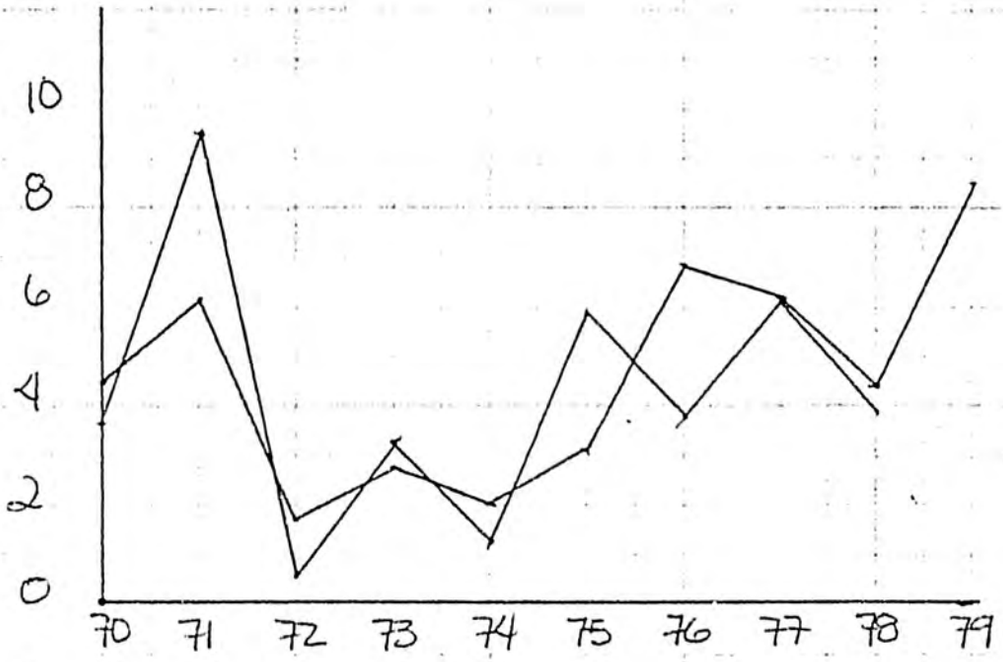
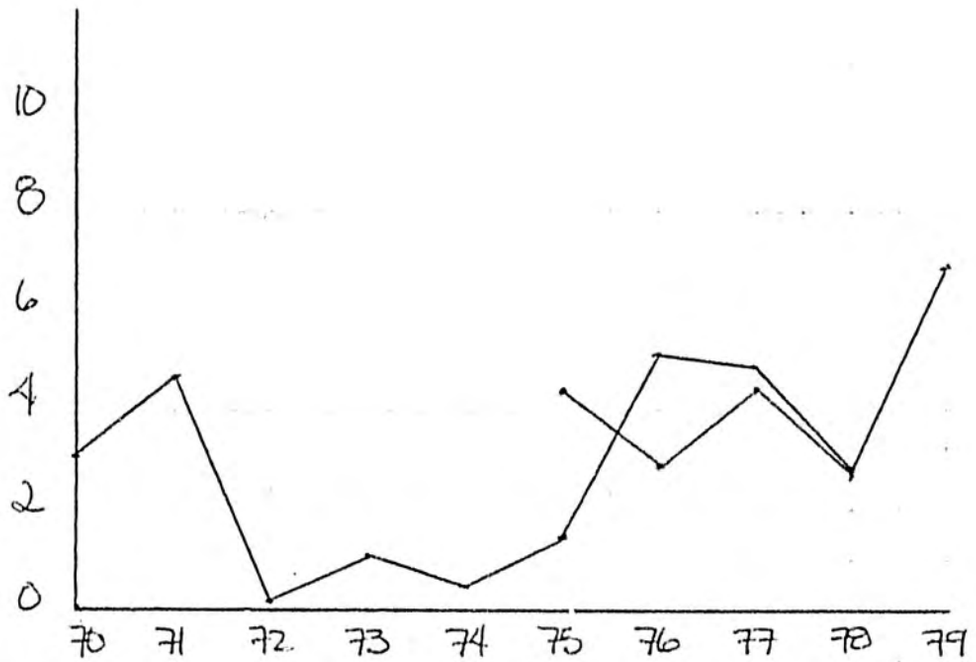
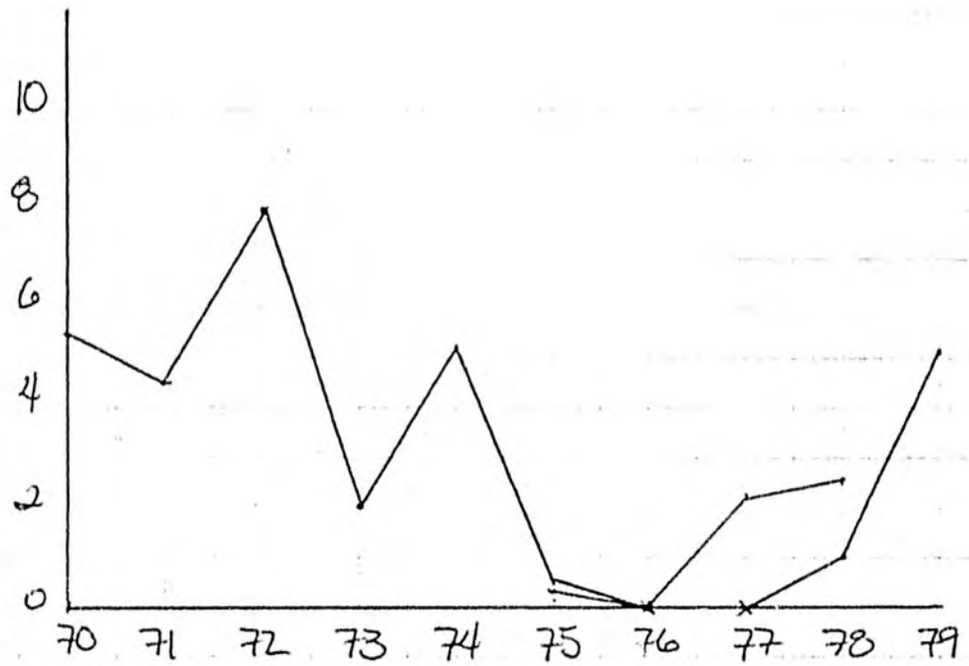
Prince William Sound
RUN
CHUM



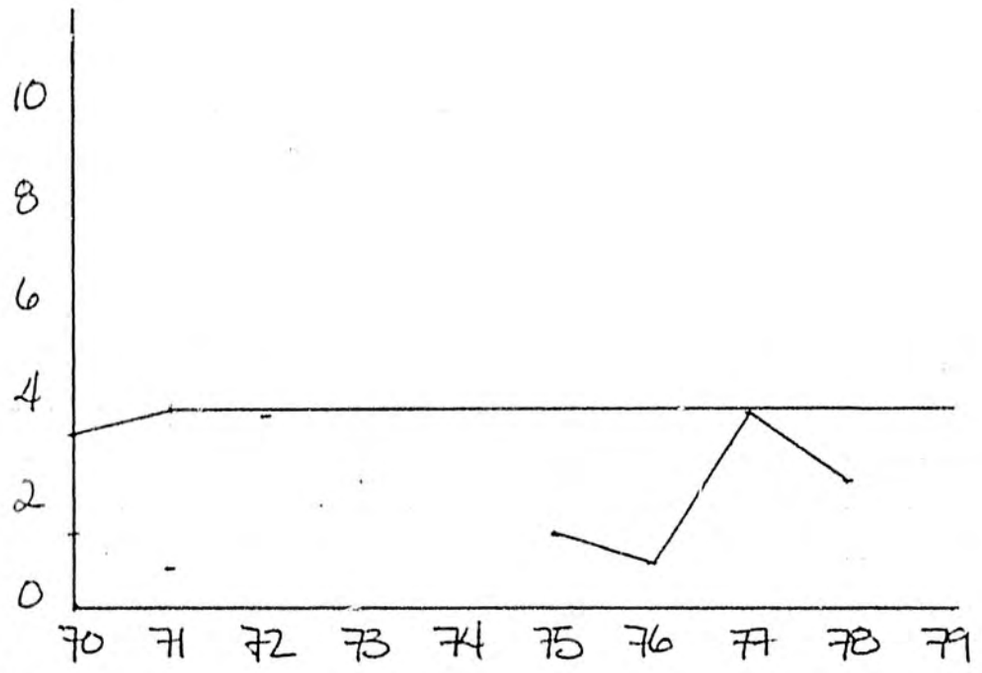
Prince William Sound
RUN PINK



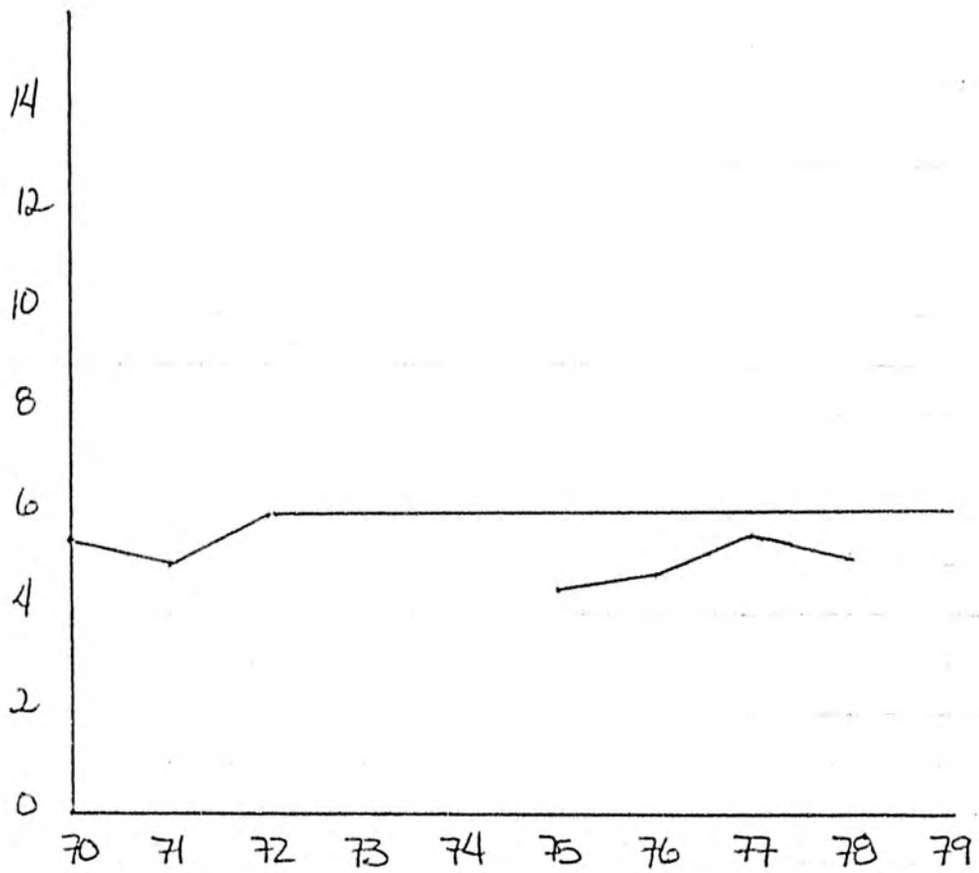
Prince William Sound
HARVEST PINK



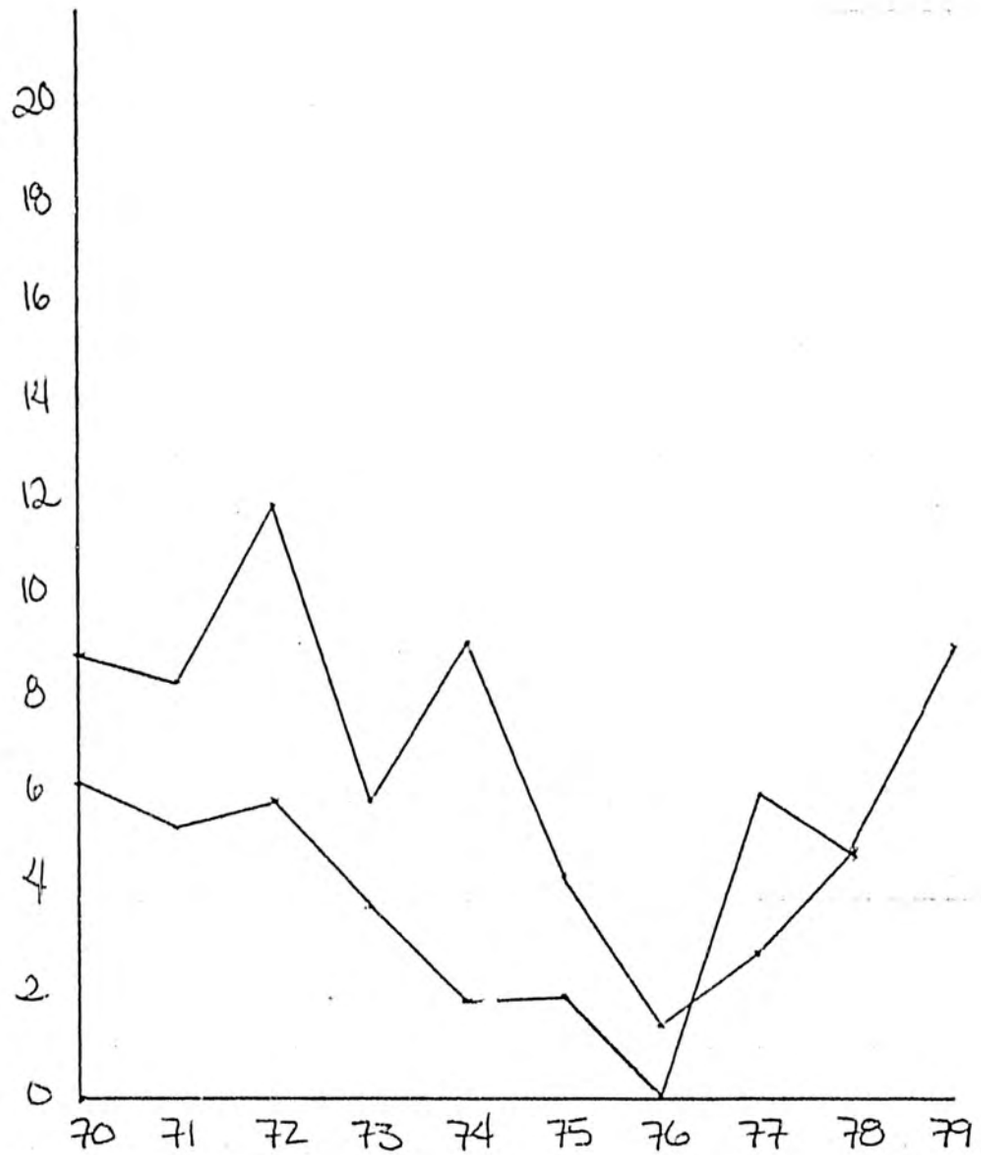
Northern Southeastern
HARVEST PINK



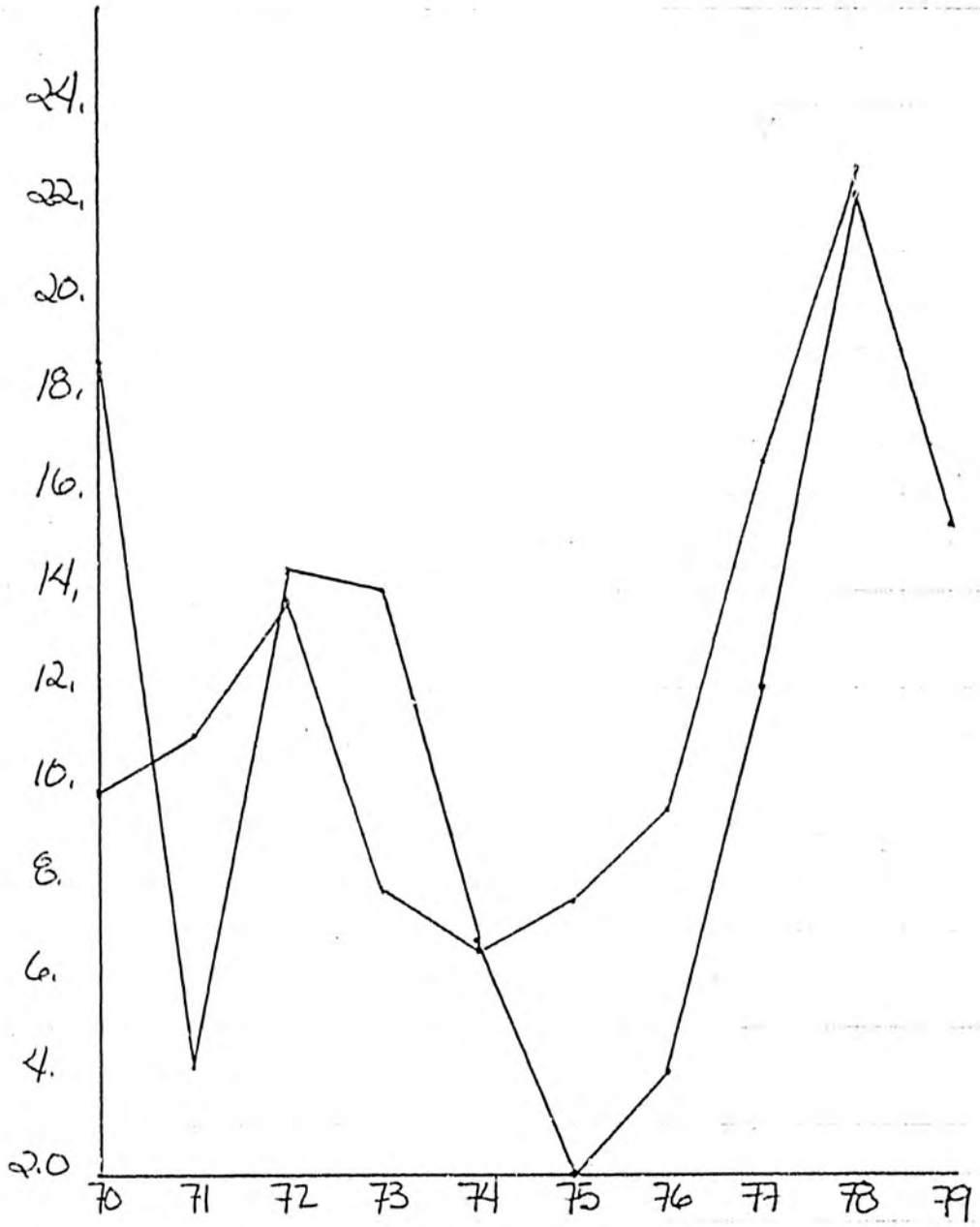
Northern Southeastern
ESCAPEMENT PINK



Southern Southeastern
ESCAPEMENT PINK

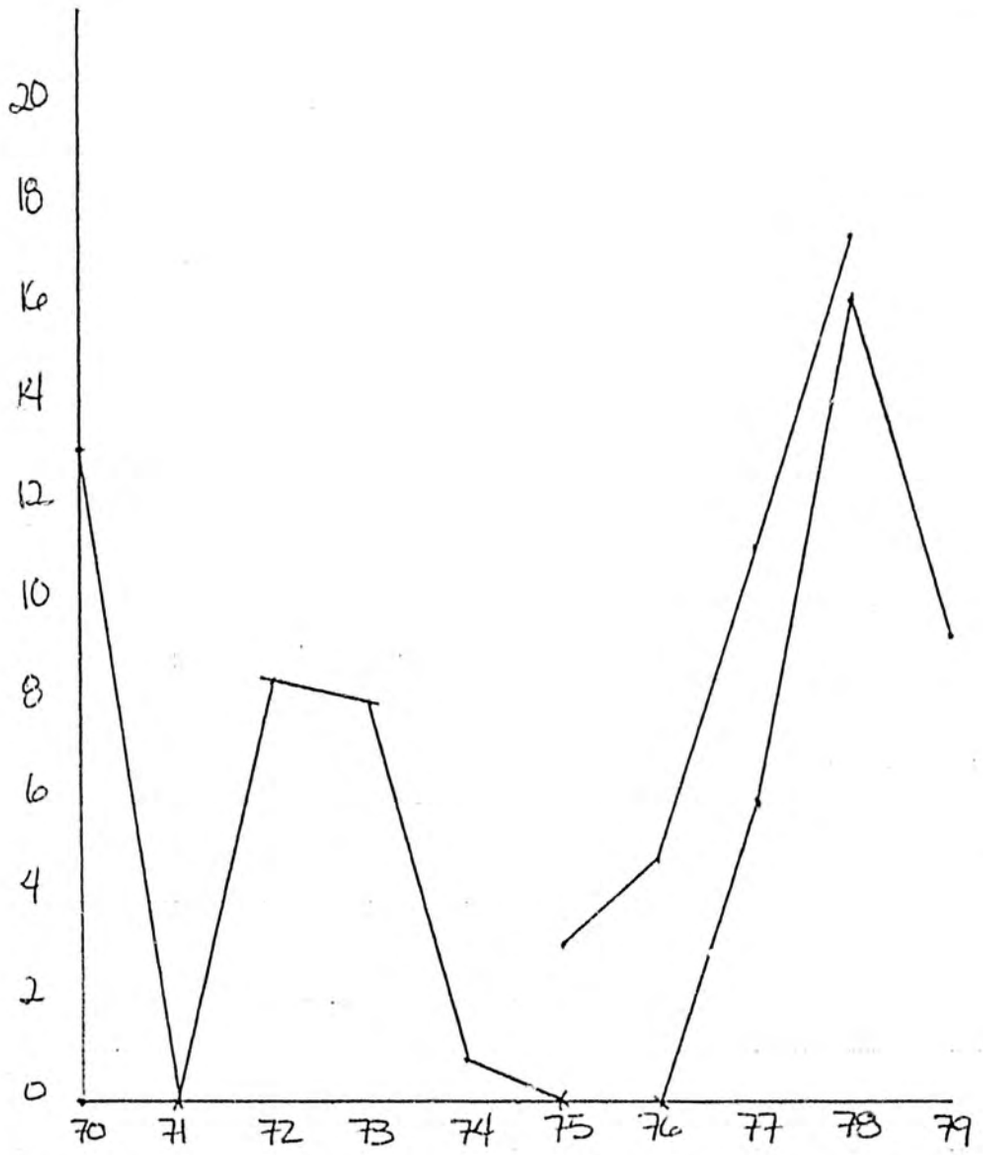


Northern Southeastern
RUN PINK



Southern Southeastern
RUN PINK

—— = forecast —— = actual



Southern Southeastern
HARVEST PINK